354 Vol. XLVI JULY 6th 1944

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SHE's troughed and churned through all the Seven Seas. Through the icy wastes of the Atlantic, the tropic haze of Capricorn, the blue heat of the Mediterranean, leaving a white plume in her wake behind the Red Ensign. She's battered and old and ugly; her squat shadow falls against the sun-reddened waters; her ungainly form is silhoutted black against the crimson of the setting sun. Thus, affectionately, we think of her. With her precious dangerous cargo she triumphs over mines and submarines and hostile aircraft while running the gauntlet of dangers common to those that go down to the sea in ships. Salute the tanker!

We didn't always think of her that way. Ungratefully we took her for granted. We drained the sumps and refilled with fresh oil. But now, when waste is a crime of conscience against brave men, and all for which they fight, it's different. Oil must be made to do its duty to the very last.

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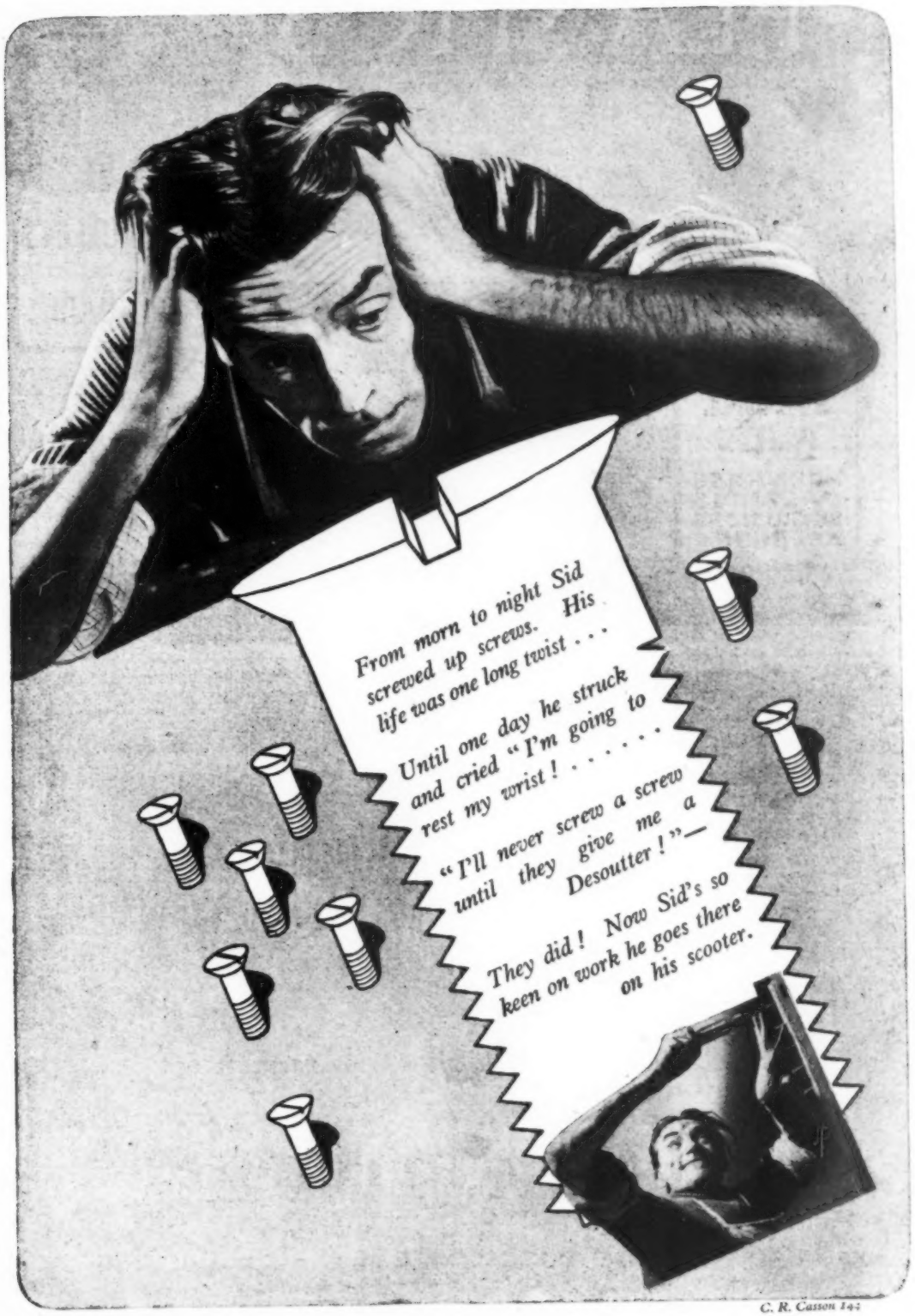
From morn to night Sid screwed up screws. His life was one long twist . . .
Until one day he struck and cried "I'm going to rest my wrist! . . . . . .
"I'll never screw a screw until they give me a Desoutter!"—
They did! Now Sid's so keen on work he goes there on his scooter.
C. R. Casson 142

PLASTICS

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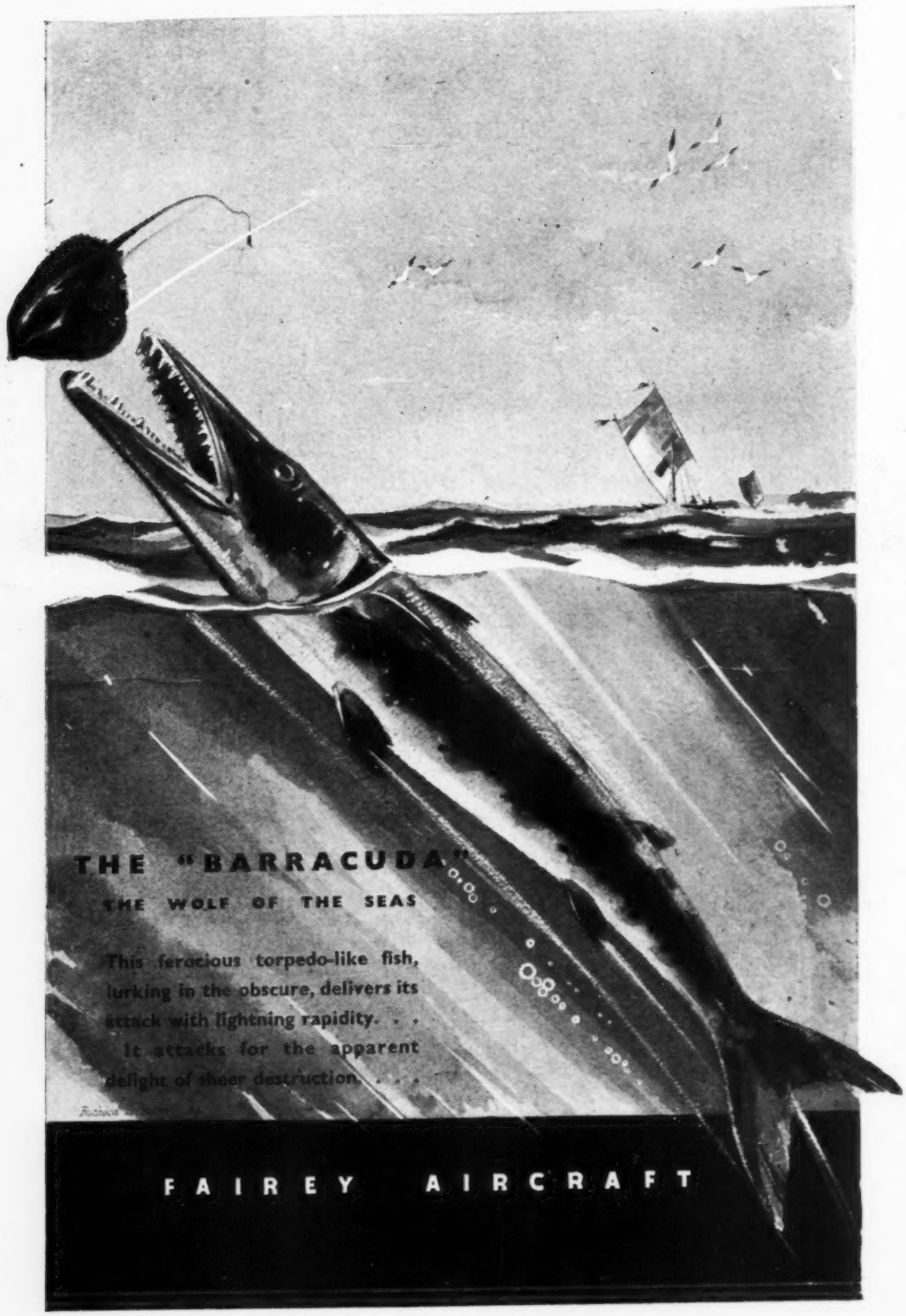
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FAIREY AIRCRAFT

FLIGHT
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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Cobblers and Lasts

THE outbreak of this war found Britain unprepared, as everybody came to realise at the time of the Munich humiliation. This unpreparedness consisted not only in paucity of forces and equipment, but also in organisation of what forces were actually in being. The logic of practical experience in fighting has led to some reforms which point towards a better alignment of fighting power in the future.

Sensible reform must be based on the abandonment of the pernicious system of operational control, except as an occasional and temporary measure. So long as we continue to have three separate Services every unit ought to be raised, equipped and controlled by the Service for which it fights. Air squadrons whose whole duty is reconnaissance for the Army and spotting for the guns form no part of air power, and ought to be part of the Army. Before the war it had been agreed that 50 per cent. of their pilot-observers should be Army officers, but they had to be seconded to the R.A.F. and hold temporary commissions in it. This was clumsy; and now the pilot-observers of the Austers which perform these duties are Royal Artillery officers whose status is not complicated in that way. That is one move in the right direction.

In the second place, the A.A. guns and searchlights which work under the operational control of A.D.G.B. certainly ought to belong to the R.A.F. and not to the War Office. At the present moment some of these guns are manned by the R.A.F. Regiment, and that is another step towards rationalisation of our forces.

Likewise, it should never have been necessary for the Army to raise the bodies known as Commandoes. Their work, according to history and logic, is a function of the Royal Marines. In the early years of the war the R.M. had been so reduced in numbers that they could not undertake it; but now R.M. Commandoes have been formed, and have been in action in Normandy.

The ideal may be one Service of sea, land and air, with only one uniform. The practice of appointing supreme commanders seems to point to that future; but in the meantime a logical arrangement of our forces is being gradually introduced by the sheer impossibility of fighting successfully without it.

Blasting a Way

THOUGH much has been written in official communiqués about the close support which Tactical Air Forces give to ground troops, concrete instances have seldom been mentioned. Of course, everyone remembers those now distant days when the German Stukas used to break down Polish or French strong points, and, on the other hand, many remember how, in the Libyan campaigns, Rommel's tanks used to defy the efforts of British aircraft. In Africa the "tank-busting" Hurricane was presently brought into action, but the general opinion seemed to be that it was a useful ancillary, but that too much must not be expected from it. In fact, in those days the theory prevailed that the only answer to enemy armour was stronger armour. Later, in Tunisia, wide and rather airy statements were made about the air blasting a way for Montgomery's ground troops, but it was left to the reader to fill in the picture according to his own imagination.

Last week there came some news from Normandy which gave a concrete instance of aircraft clearing the road for our ground troops. In the fighting around Caen British infantry and tanks were held up at the village of Esquay by four German heavy tanks with 88 mm.

guns. In time, no doubt, anti-tank guns could have been brought up to the help of our men, but actually there was no need to wait for them. Air assistance was called for, and promptly there arrived overhead rocket-firing Typhoons. Every one of these aircraft carried eight rockets, each the equivalent of a 6in. shell. In fact, it could fire the equivalent of the broadside of a 6in. gun cruiser, and it had cannon in addition. This formidable battery speedily silenced the enemy tanks; and we may suppose put some at least of them out of action for good and all.

That is the sort of help from the air which the Army appreciates, and which the readers of newspapers can understand. A few more such details would be very welcome to all.

Flexibility

NOT many days after this episode of the Typhoons there was an instance of heavy Lancasters and Halifaxes bringing tactical help to the Second Army in daylight. It has always been preached in *Flight* that a bomber force needs to be flexible, ready to deal with the salient emergency of the moment, whether that be help for the Navy, help for the Army or independent air action. Also, we have always preached that in air action tactical needs must take precedence of strategic desirabilities.

The Air Staff is of the same opinion, and in the old days of Army Co-operation Command it was given out that when the Second Front came into being, not only that Command but the whole might of the Air Force would be available to help the Army. That shows that an advance has taken place in air thought since 1918.

Allied heavy bombers were first used to give tactical support to the Army in the early days of the Italian campaign. It may not on that occasion have been strictly necessary to use them in that way, but it cheered the soldiers up.

Last Saturday there was certainly need of heavy metal, for a concentration of German armour and troops was discovered near Villers-Bocage. Attack from above was clearly indicated, and General Eisenhower has not got heavy bombers in his Command. The request was passed on to Air Chief Marshal Harris, and it must have caused him some inconvenience. A certain force was already bombed up for night operations, and hurried measures had to be taken to change the bomb load and get the aircrews ready for this very different task. The R.A.F. shines in such emergencies, and the new plan was duly carried out. The principle of bomber flexibility was triumphantly vindicated.

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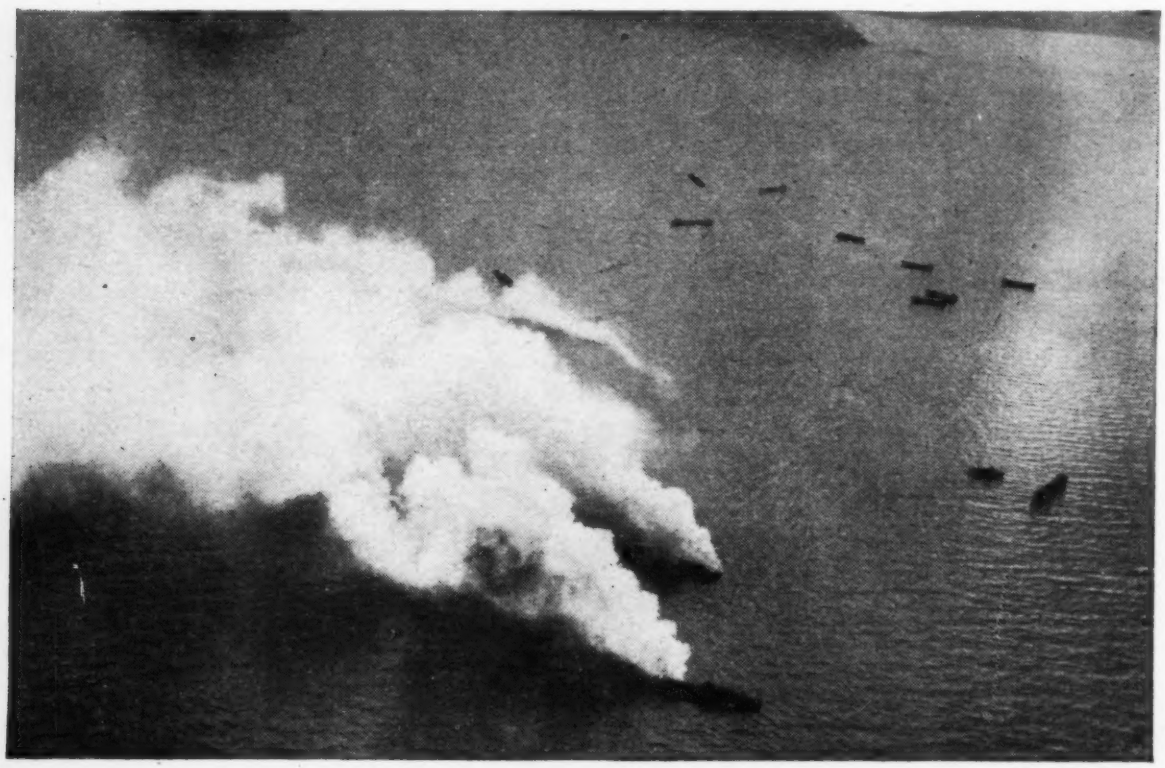
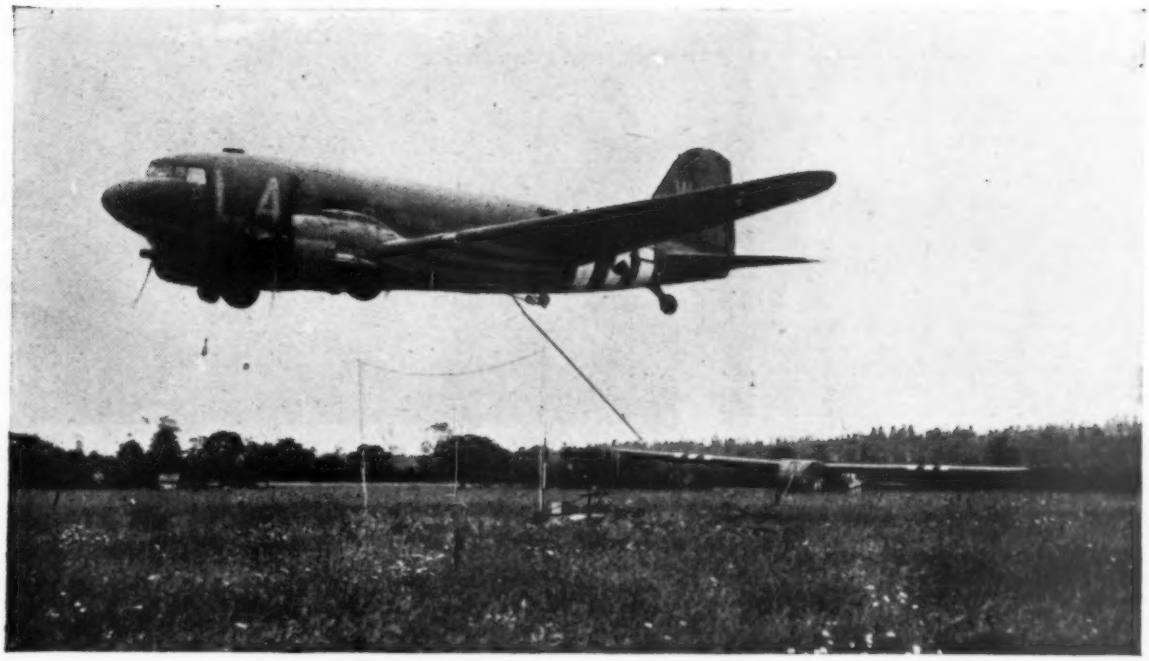


SHADES OF NAPOLEON: An R.A.F. photograph of the occupation of the island of Elba on the morning of June 17th. A smoke screen is being laid to cloak the attack.



RETURNING THE EMPTIES: A Ninth U.S. Air Force Dakota picking up on tow a stationary CG-4 glider. The Nylon tow ropes used to take up the shock have pronounced hysteretic qualities.

WAR in the AIR

Air Attacks on Oil Refineries : The Shuttle Service Surprise : Night Precision Bombing : Waning Japanese Air Strength

THE Germans have been losing a lot of men recently. The Prime Minister has told the House of Commons, with regret, that up to the capture of Rome the British Army in Italy had lost over 73,000 men, killed wounded and missing. This figure did not include losses by the Navy or Air Force, but they cannot have been very heavy. We may contrast this figure with the estimated losses of the Germans in the Cherbourg peninsula, which are put down at some 75,000. On the other parts of the Normandy front the German losses are said to have been much heavier than ours. Then, in Vitebsk, where 700 Stormoviks bombed the city for an hour, the Russians say that they found 600 dead Germans in the streets. Between June 23rd and 27th the Russians say that the Germans left 32,000 dead on the battlefield.

In the fighting round Minsk the Red Air Force has achieved domination of the skies to an extent that it had never previously reached.

The bad weather last week seriously reduced the amount of help which Sir Trafford Leigh-Mallory could give to Sir Bernard Montgomery; and as a result Rommel was able to bring up some reinforcements to his fighting front. They must have had a hard task to get there, for airmen say that the roads and rails to the rear of the Germans are a mass of destruction.

FOR THE LOOK SEE: Landing a Piper Cub from an American L.S.T. during the capture of Japanese-held Wake Island.

WAR IN THE AIR

Still, some reinforcements did get up, but they are said to have arrived in small batches, and to have been thrown into the battle piecemeal as they arrived.

One may conjecture that when Gen. Montgomery has obtained enough elbow room, so that he can manœuvre his armour, he will want to see all Rommel's reserves committed to opposing him, as well as any which Rommel may induce Runstedt to send up. That would pave the way for one of the other landings which the Prime Minister adumbrated. We may all hope, too, that the Pas de Calais may be occupied before long, and the bases of the robot bombs captured. In the meantime those bases are pounded day and night by medium and heavy bombers, while fighters shoot down numbers of them in the air. Clear skies over the Channel will give the defences a better chance.

Good Shooting

NOT long ago an Allied bomber did better than it probably knew when it hit the railway station at Orleans. There was a troop train in the station, and 700 German soldiers were having a meal there. The bomb or bombs killed 120 and wounded another 300. The senior officer was among the killed, and the Germans have stated that had he survived he would probably have been executed for exposing his men to such a risk.

The Fortresses and Mustangs which recently landed in Russia after their raid on Berlin have emerged once more, and on their way back they provided yet another surprise. They did not return straight to England, but flew to Italy, and on their way they bombed an oil refinery in Polish Galicia. It must be very galling to Göring and Co. to see Allied aircraft roaming across the Fortress of Europe in this way. But then, they know in any case that the war is lost, and that nothing remains for them but last-ditch resistance. Everyone has always admitted German courage, but nobody will write them an epitaph saying "This was their finest hour."

A further comment on the international situation comes from Canada, where recruitment for the Royal Canadian Air Force has been suspended. There are now more air crews than are likely to be needed. In consequence, pilots under training will receive an additional eight weeks' instruction.

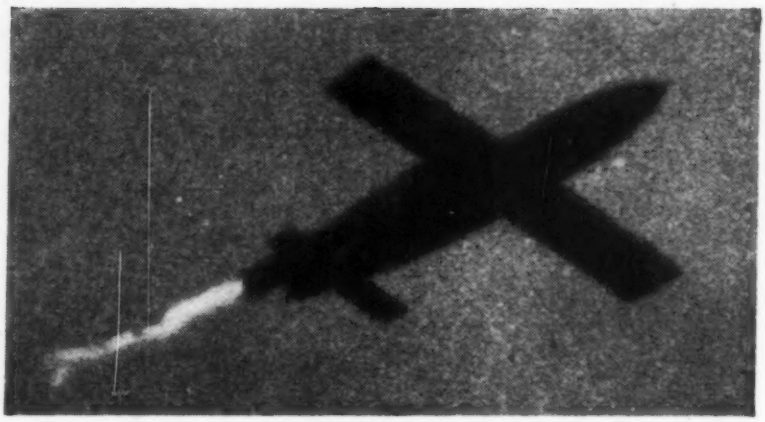
Night Precision Bombing

IN the early days of the war it used to be given out that the crews of Bomber Command were so skilful in bomb-aiming that they could select their targets and hit them accurately at night. Later on, this claim was silently abandoned, and in the heavy bomber offensive against Germany the practice of area bombing was introduced. In no other way could the Command be certain that all the small factories contributing to German production were put out of action. Then came the Pathfinder method, which was much more selective. At the beginning of the present year, when the object was to destroy targets in France without doing avoidable harm to the French, this method was developed until it became known as night precision bombing. Details cannot be published, but this method has been much used of late in attacks on oil refineries and other individual buildings.

Next after communications such as roads and railways, oil is now considered one of the best objectives for Bomber Command, and the American day-bombers have also given much attention to it. Oil is, in a sense, part of the communication system of the enemy, as without it transport cannot use the roads. It is probably impossible to destroy all the oil stores of the enemy, but it may sometimes smooth the path of our invading troops to set a certain store on fire; and since the repeated attacks on the oilfields of Rumania, the prospects of replenishment have been much reduced.

Pacific News

THE Japanese have now abandoned the air defence of western New Guinea, where not long ago it was their custom to pour in aircraft regardless of losses. As a result of the new situation General MacArthur has regrouped his Air Forces. He has formed the Far East Air Force, and has combined in it two very experienced formations, the 5th and the 13th Air Forces. The precise significance of that reorganisation cannot be discerned from a distance; but it may



SYNTHETIC COURAGE: A German pilotless aircraft does a little blind flying over southern England.

GROUND STRAFE: A Heinkel 177 as it appeared in the sights of a Mustang pilot just before firing his guns.

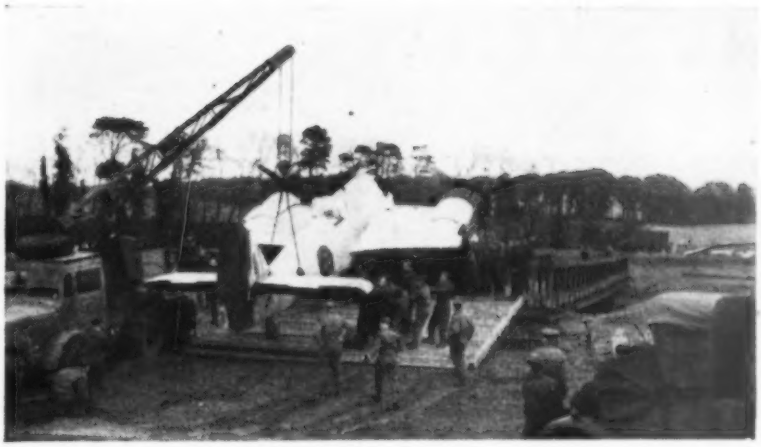
WAR IN THE AIR

soon be explained by correspondents on the spot who are in touch with the situation.

In Washington the new Secretary for the Navy, Mr. Forrestal, who has succeeded the lamented Col. Knox, has stated that the Japanese fleet's aircraft has been virtually annihilated. In the recent battle off the Philippines the enemy's losses in aircraft were reported to be extremely heavy, while the effective strength of his carrier fleet was also seriously diminished. Aircraft can be replaced to a certain extent from the factories, though it is doubtful whether Japanese production has been able to keep anything like pace with the rate at which the Americans have been destroying them. Carriers, however, cannot be replaced in a hurry, and it has been officially announced that by the end of the present year the United States Navy will have 100 carriers of all classes ready for action against Japan.

Mr. Forrestal also made the cheering announcement that the island of Saipan, which the Americans recently occupied in spite of strong resistance, would be a good base for surface and air attacks on Japan itself, on the Philippines, and on the Netherlands East Indies. Germany is not the only Axis country to see the writing on the wall.

FRUITFUL : Airmen on the Arakan front help themselves to generous bunches of bananas.



BEAU BRIDGE : Shifting a Bristol Beaufighter across a single-span Bailey bridge.

Et Dona Ferentes

THE Germans, through their broadcasters, have made an offer of a deal with Britain, namely, that if the British will stop their strategic bombing of German industrial targets (which they call "terror-bombing") they will refrain from the use of robot bombs and any other similar device which they may have up their sleeve. At least that is what they apparently intend us to believe, though the wording of the broadcast hardly makes such a firm offer. If it did, we should surely be very simple if we expected the Germans to keep their word.

They, on the other hand, must be very simple if they think that at this moment, when Allied victories are mounting up on all sides, we should make any bargain which would in any way weaken our swordarm. It is evidently the opinion of our High Command that destruction of Germany's oil resources at this juncture is likely to shorten the war, and so to save the lives of Allied soldiers. The blind bombing of the south of England holds out no corresponding prospect for Germany. If we were to forgo the destruction of oil refineries just now, more German tanks might get into the firing line, and more Allied soldiers might lose their lives. We do not intend to "salute the soldier" in that way. The German suggestion smacks rather of the story of the horse of Troy.

Somewhat of a similar nature is Hitler's declaration that Florence is a free city. The Allies certainly will do all in their power to prevent damage being done to its priceless treasures, and General Alexander has shown that he is a master of the art of manœuvring the enemy away from a place which he does not want to attack. Rome was saved by his skill in that direction. Military targets in Florence or anywhere else must be bombed, and perhaps afterwards shelled; but the utmost care will be taken by the Allies in selecting their targets.

The bombers of the Allied forces in the Mediterranean have been striking at oil installations and railway yards in Hungary and Yugoslavia. The enemy has now realised that these places are within Allied reach, but for a long time he thought that they were and would remain immune. Still, the strategic interest of the Italian campaign hinges more on Army progress than on air operations. General Alexander's advance has been rapid whenever the weather has made quick movements possible. No doubt is felt that within a reasonable time he will liberate all northern Italy; and then comes the really interesting question. When he commands the Grande Corniche from Italy into France, and also the route to the east, will he strike to the east or to the west? Or both? The decision, of course, will have already been taken by the Allied High Command. The frequent bombings of targets in southern France certainly suggest an invasion of the French Riviera, which might well be synchronised with a landing from Corsica. That would set a nasty problem for Runstedt. Rommel's cries for more reserves would not be likely to grow less, and the commander in the Midi would be equally insistent.

On the other hand, an Allied army marching to the assistance of Tito would create a new situation in the Balkans, and the effect of such a move would certainly be very far-reaching. It seems that Runstedt has already persuaded Hitler to give him some divisions from Russia, though the task of moving them across Europe cannot have been easy. The preliminary Allied bombing attack on railway centres and road junctions has had its effect.

HERE AND THERE

Russian Theory

PRAVDA, writing recently about the German flying bomb, said: "This weapon has been produced as a result of an acute shortage of German pilots."

M.G. Exchange

THE four 0.3in. machine guns fitted in the wings of the Airacobra are now being replaced by two 0.5in. guns. These are mounted under the wings in small streamlined bulges which are similar to those that were fitted on the Gloster Gladiator.

More Indian Pilots

AN Indian Air Force squadron has joined the Third Tactical Air Force on the Burma front.

Flying Hurricanes, the Indian pilots, whose average age is 20, went into action several weeks ago and have logged nearly 1,000 operational hours on patrols, escorts and night and day strafing of the enemy in the Arakan and Imphal areas.

Peerage for Sir S. Hoare

FLIGHT offers its sincere congratulations to Sir Samuel Hoare, on whom H.M. The King has conferred a Viscounty. The honour has been doubtless awarded chiefly on account of Sir Samuel's services as Ambassador to Madrid at a very difficult juncture. But he has held many posts, and in particular has been Air Minister three times. He was, in fact, the first Air Minister since the last war who really distinguished himself in that office. It was owing to his initiative that Imperial Airways was formed.

Birthday Surprise

AIR MARSHAL SIR RODERICK HILL, commanding A.D.G.B., sprang a "birthday surprise" on airwomen of his command when he told them that they would shortly be going over to the Continent to serve with the Allied Expeditionary Air Force.

The Air Marshal, addressing a parade to celebrate the fifth anniversary of the W.A.A.F., expressed the R.A.F.'s appreciation of their work.

BURMESE CONTRAST: Coolie women on a forward airfield strike a vivid contrast with a C-47 of Air Transport Command of South East Asia Command.

"Target for To-night" Star Decorated

GROUP CAPT. JOHN A. POWELL, R.A.F., who, says Reuter, has been awarded the United States D.F.C. for bringing back a Liberator, in which he was observer, after the pilot and co-pilot had both been wounded, was one of the chief players of the film "Target for To-night."

He has spent 15 of his 35 years in the R.A.F.

"Smithy's" Nephew

WING CDR. ROLLO KINGSFORD-SMITH, D.F.C., of Mosman, New South Wales (a nephew of the late Air Comdre. Sir Charles Kingsford-Smith), has relinquished his command of an Australian Lancaster squadron in Britain. He has been posted to an operational training unit.

Wing. Cdr. Kingsford-Smith, who was awarded the D.F.C. last month, took command of his late squadron at 24—the youngest bomber C.O. at that time.

Improved R/T

MASTER SGT. JOHN M. MAYER, of Philadelphia, Communications Chief with a Fighter Control squadron of the Eighth Air Force Fighter Command, has been awarded the Legion of Merit for devising a highly complex radio equipment which has greatly improved radio communication between Fighter bases in England and their Fighter pilots in combat over Europe.

His device has been adopted by the Eighth Fighter Command, states American Air Headquarters, with a resultant speed-up of messages and elimination of switching failures.

Double Service

AIR Service Command and Troop Carrier Command pilots of the Ninth Air Force are transporting an average of 100 tons daily of high priority cargo to U.S. Forces in France, then evacuating between 500 and 800 wounded in their returning aircraft.

Major Milton T. Evans, commanding a Ninth Air Force Service Command Transport Squadron now operating out of Normandy, gave this estimate.

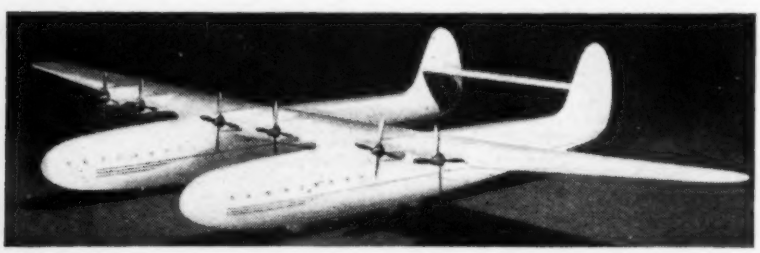
As more aircraft are put in use by the squadron, Major Evans expects to be evacuating between 1,000 and 1,200 wounded soldiers daily within a short time.

R.A.F. Wounded

RELATIVES of R.A.F. wounded are asked not to be worried if their husband or son writes them from a R.A.F. casualty clearing station in this country, and his address is given as "somewhere in England."

R.A.F. casualties, when they arrive by air, proceed to a R.A.F. casualty clearing Hospital in the south within 36 hours, and sometimes in less than a day. They are later removed to a base hospital.

It is not possible for relatives to visit the wounded at the casualty clearing station, but it can be done as soon as they arrive at the base hospital.



WINGS TO COME: A Scots design for post-war production to carry 100 passengers and 27,000 lb. of freight on Trans-Atlantic routes. Total weight 300,000 lb.

Pan-American Proposition

MR. JUAN T. TRIPPE, President of Pan-American Airways Corporation, in his annual report to stock-holders, said the interest of the U.S. would be best served by a single American international operation of air transport.

"Such an operation," he said, "should be strong enough to compete on even terms with the great foreign flag air

HERE AND THERE

transport monopolies created by the other principal trading nations. It would take the form of a community company in which all American transportation interests able to contribute would be permitted to participate under an organisation approved by the Government.

"Your company has considered that the policy of the Government on an issue of this importance must be determined not by the interest of any company or group of companies, but by what would be best for our country as a whole," he said.

Memorial to Staniland

KEDDINGTON Parish Church (Lincs) recently received from Mrs. Millicent Staniland a church organ, presented by her in memory of her son, Christopher Staniland, who lost his life while testing a new aircraft. The organ came originally from the parish church at Weybridge, but a new case has been built for it by a firm of Lincolnshire organ builders.

The organ was dedicated by the Right Rev. the Lord Bishop of Grimsby.

Bug Busters

SO important is the job of keeping down the locusts in Persia and East Africa that the R.A.F. maintains a special Locust Flight, and a recent experimental campaign in "dusting" the pests from aircraft has resulted in the destruction of enormous numbers of them.

Meetings have now begun at the Colonial Office to discuss next autumn's operations and to consider further improvements in technique. Among experts attending these meetings are two officers from the R.A.F. Locust Flight, and Mr. H. W. Bedford, chief entomologist of the Sudan.

Getting the "Gen"

AIRCREWS at a medium-bomber base of the Second Tactical Air Force whose special job it was to attack the launching places of the German aerial torpedoes were instructed by means of a model of the launching ramps.

During that period when the news was only allowed to refer to "military installations in the Pas de Calais," this model was a secret shared only by those who actually had to deal with these targets, but it enabled them to spot the things in spite of heavy camouflage.

Detecting and destroying these launching ramps became a day-by-day routine for Mitchells, Bostons and Mosquitoes.

Silver Thimble Fund

AN appeal is being made by the Silver Thimble Fund for donations to provide air ambulances in which to bring wounded fighting men back from the battlefields. The smaller type of air ambulance at £6,500 is intended.

AL FRESCO OFFICE : The R.A.F. lost no time in establishing air strips in France when the invading Allies began to move inland, and here is Flying Control at work on one of the first of them.

Although registered in 1939, the Silver Thimble Fund operated during the 1914-18 war and provided motor ambulances, mobile surgeries, and hospital boats, besides making grants to a series of hospitals. Since September, 1939, it has already provided two air ambulances and an air/sea rescue launch, numerous field ambulances, mobile canteens, and various medical units.

"Thanks a Million"

NOT since the Battle of Britain has there been greater cause for gratitude to the R.A.F. than exists at the present time, and the R.A.F. Benevolent Fund hopes that the familiar phrase, "Thanks a Million!" will be given practical effect in its drive to raise £1,500,000.

Until the end of next week the fund is occupying the Bristol showrooms at "Aviation Corner," Piccadilly, where donations will be gladly received.

Changes at Vokes

CERTAIN changes in the Vokes organisation have been found necessary to cope with the rapid growth in production under wartime difficulties which have placed increasing burdens upon the managing director, Mr. C. G. Vokes.

Mr. A. A. Smith, for several years chief designer, becomes deputy general manager, and assistant chief designers have been appointed in Mr. A. Freedman (production) and Mr. R. Chaffey (development). Mr. A. W. Culver hands over the duties of chief inspector to Mr. A. E. G. Sly and returns to his former position of sales manager.

Mrs. Tate Speaks Out

MRS. MAVIS TATE, M.P. for Frome, said at Bristol recently that Britain needs to be more concerned with air travel than any other country because of its importance as an Empire link.

"We have poured money into many countries like Brazil and the South Americas, but neglect our own possessions. Bathurst in West Africa should have been one of the finest airports in the world, but it is nothing more than a corrugated iron slum. Civil aviation in Britain was in a disgraceful state before the war, and there is a danger that we shall not be air-minded after the war.

"We are fighting for democracy," she added, "but we must take a vital and personal interest in the Government after the war to see that we get it. You may have some form of Government in which the State will do everything and you will be shuffled about like so many robots."

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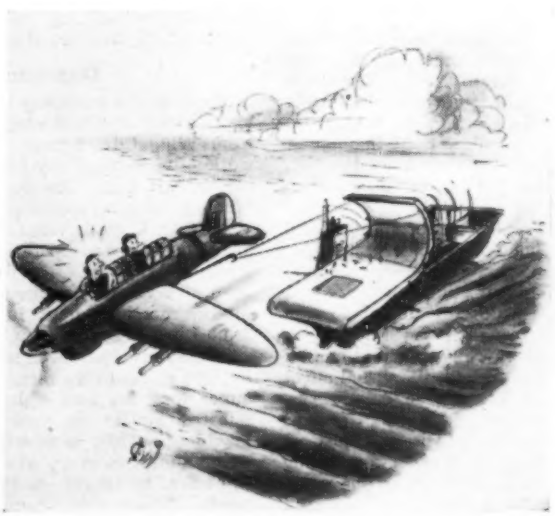
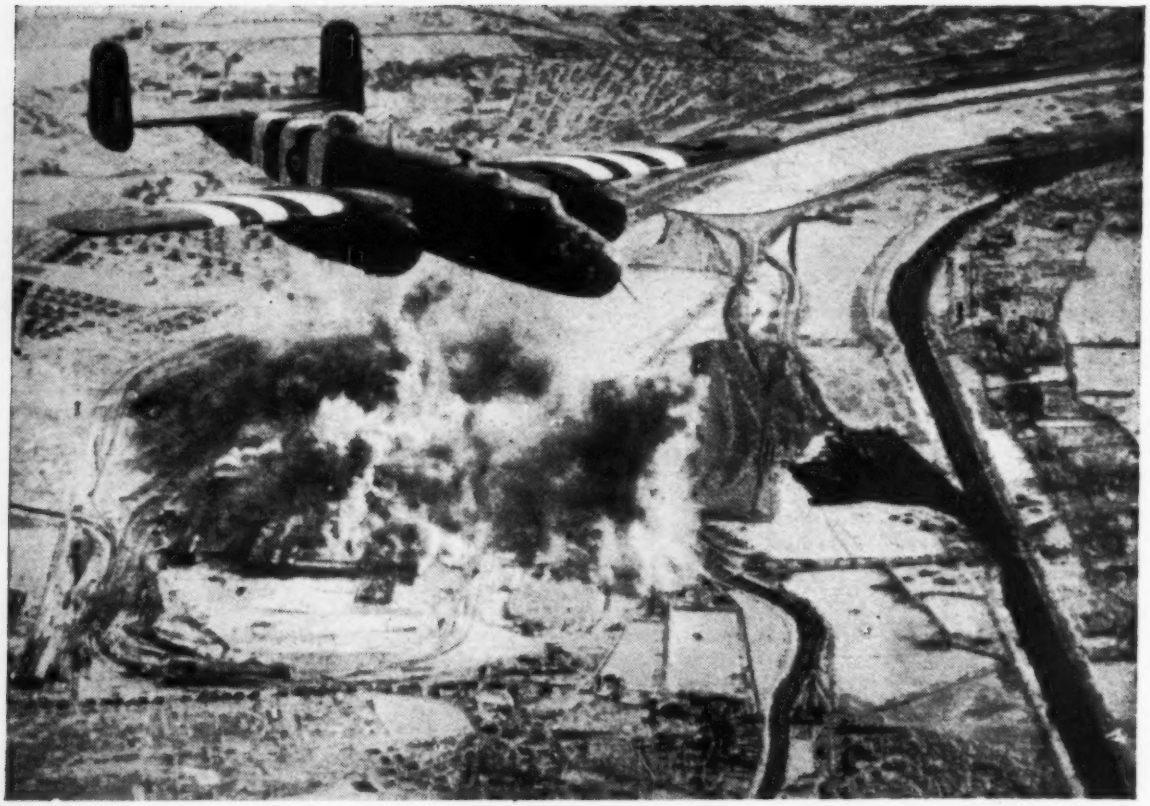


"Blimey! I knew we shouldn't have gone round again!!"



The attack by Mitchells on the steelworks at Caen which were only about 1,000 yards from our own troops.

Invasion Close-up

Air News from the Notebook of Our Correspondent with the Allied Expeditionary Air Forces

STOOGING around above the English Channel in murk the other night, I found myself in the way of a number of doodle bugs or, as we British might call them, thingummies, as they left the French coast full of ersatz bravery. The experience was eerie, to say the least. A number of readers of mature age will remember what street lamps looked like on a foggy night. Step that glow up considerably in both intensity and size, then imagine it rushing at you at a relative speed of about 400 m.p.h., and you have the effect. In a clear sky, of course, they appear as a sharp ball of fire.

By the way, here is a little tip which roof spotters and fire watchers may find comforting. It is something every aircrew has to learn. Because of perspective, every tracer coming up from a target *flak* appears, until the very last moment, to head straight for the aircraft in which you are flying, then it appears to swerve away very sharply. So, if you are on a high roof and watching in the direction from which the air torpedoes are launched, the visual effect will be much the same but on a larger scale.

One more note on air torpedoes (which the Germans called an anti-invasion weapon but which was just as dead on that occasion as the live *Luftwaffe*). I was sitting in a tent at an R.A.F. Mitchell station, when one came directly overhead making more than the usual noise and appearing to be just scraping the tree-tops. A sharp bang was heard in the distance, and shortly afterwards a New Zealander landed his plane and said he had shot it down, bringing his "bug log" up to nine. The pilot had chased the bomb in southern England.

Day-bombers' Share

Much of the foregoing is by the way, as I was actually visiting the Mitchell station to get the story first-hand from Wing Cdr. Lynn, D.S.O. and Bar, D.F.C., of the work of a typical day-bomber station of Sir Leigh Mallory's A.E.A.F. In particular I wanted to hear an account of the bombing of the steelworks near Caen. Wing Cdr. Lynn is Wing Commander Flying at the station and has over 150 operational flights to his credit—88 of these in Mitchells. He flew Fairey Battles in France in 1939. Before he became airborne, so to speak, he trained for the merchant navy in South Africa. In his ship was Sqn. Ldr. Nettleton, V.C., and Group Capt. Malan.

There must have been something about that ship. When he first came to twin-engined day bombers every bomb-aimer took his own sight. The arrangement is now for selected aimers to give the signal to the rest of the machines. This, in effect, is the same as having the best bomb-aimers in every aircraft. A bomb-aimer and bomb-sight are, of course, carried in every machine in case of need. Wing Cdr. Lynn's navigator-bomb-aimer is a Dutchman, borrowed from the Royal Dutch Naval Air Service who fly a squadron of Mitchells at the station, and

his bomb aiming is so good that, to use the words of a commendation, it has made history in the group.

For the six months previous to the invasion the Mitchells were engaged on a number of standard targets, such as air torpedo launching bases, marshalling yards and other communications targets. A short while prior to D-Day they were switched over to night work, and now it is only right to refer to them as day-and-night medium bombers. For night work they take it in turns with other squadrons; one drops the flares while the other drops the bombs.

Weather and Work

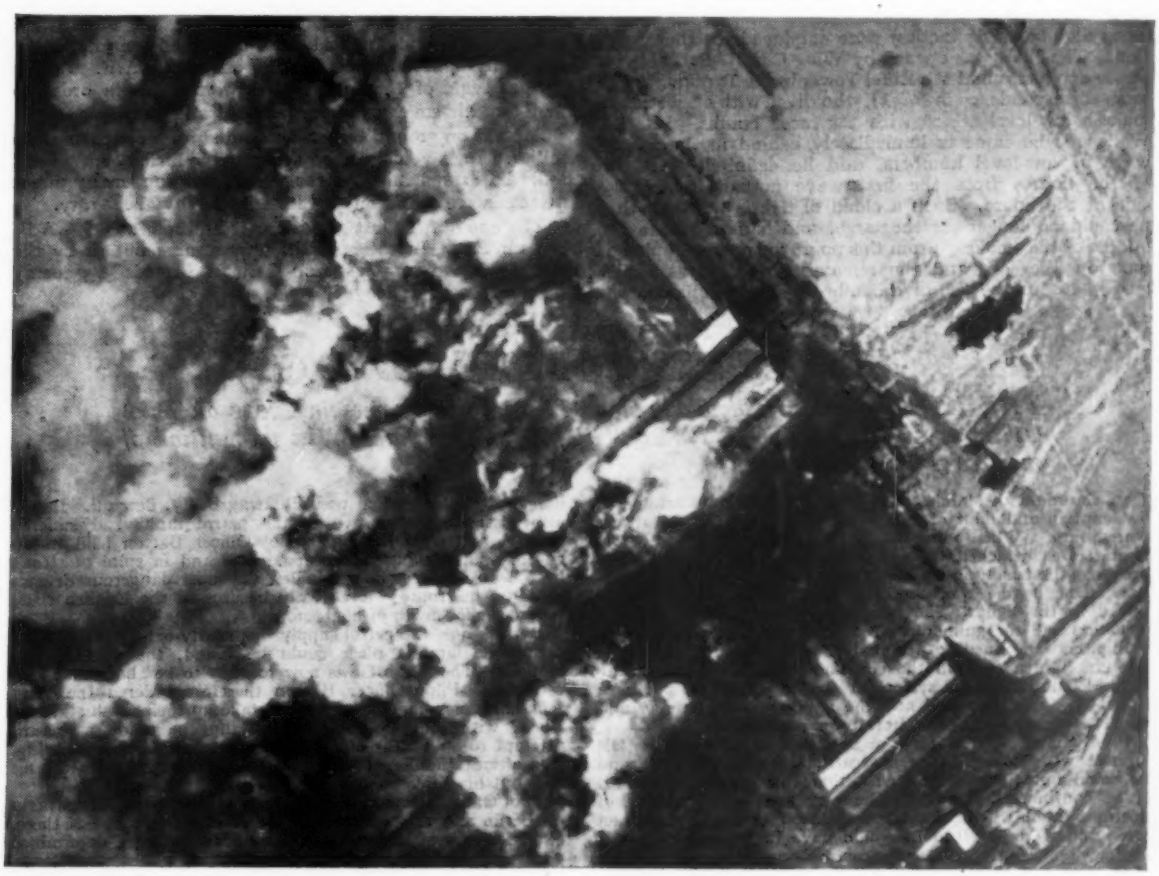
The consistently bad weather, which has been such an outstanding feature since the invasion, has precluded them from putting in an astronomical number of sorties. Yet some of the figures are interesting. In one period of seven hours, including a dusk and dawn attack, the Wing flew 102 sorties. In the first seven days of the invasion some 300 sorties were flown, and well over 800 have been completed since D-Day to date. The squadrons have done as many as three shows a day and the crews one sortie a day for a seven-day week. The classic raid on the Caen steelworks came as a request from a Division via the air liaison officers attached to the operations room. Apparently troops of the 21st Panzer Division were occupying it as a series of observation posts and gun positions.

It will be remembered that there is drawn on every operations room map a yellow line. This line is known as the bomb line, and our crews have special instructions that no bomb is to be dropped on our side of it without special dispensation from the authority. The Caen steelworks were 1,000 yards inside this line and our forward troops were approximately the same distance away. A hundred tons of explosives went down in lots of 500 lb., and the aiming was so good that only one bomb fell outside the target area. Aircraft from other stations participated, but from this wing five boxes of six Mitchells each took part. The attack was planned for the early evening, and the sky was quite cloudless with a slight grey haze up to a hard line forming the horizon and an unbroken blue sky above this. Despite the haze, however, visibility was quite good. From ten miles out to sea the whole coastline from Le Havre to Cherbourg could be seen, and it was possible, even from this distance, to identify the target.

A good formation leader develops a sixth sense which enables him to find a direction of approach which foxes the defences and yet keeps the natural advantages in the attackers' favour. Some of the things to be considered are the position of the sun, the likely direction of a fighter attack, and the probable or known position of anti-aircraft guns. With regard to fighter attacks, Wing Cdr. Lynn told me that many of his pilots had not seen a German fighter for over a year.

For this attack it was decided to go straight from the coast to the target, each box of six Mitchells to turn left after making their bombing run. Turning to the left would avoid flying over Caen where the A.A. defences were known to be concentrated.

As the Mitchells settled down to their straight run-in to bomb the steelworks, the Germans opened up with 20-30 88 mm. A.A. guns. Their prediction was good, and it seemed, time after time, that one of the aircraft must sustain mortal damage, yet all passed safely. As the formations turned for home, the Germans shot up their usual crimson smoke shell, which appears to be a signal to the German gunners as to where a barrage is to



The Caen steelworks in flames after the attack. The concentration of the bombing is phenomenal when it is remembered that some 50 aircraft took part.

INVASION

be put up. At this point the anti-aircraft fire lost its accuracy.

And so back home across a sunlit channel with no machines lost. Some had minor *flak* damage, and two of the air-gunners sustained wounds. The steelworks were completely cleared of enemy grenadiers, and an advance was made in the sector. The general commanding the division which made the original request sent a message of thanks and congratulation to the group.

H.Q. Attack

The high spot of last week was the attack by Typhoons on the German Corps H.Q. in a farmhouse at the little village of St. Sauveur Endelin. I was present when Flt. Lt. E. B. Wallace gave his account of the operation. Twenty-eight Typhoons (eight with fused bombs for low-level bombing, four with rocket projectiles, and 16 with bombs using dive-bombing tactics) were employed for the operation. The show was opened by Wing Cdr. J. R. Baldwin, whose exploits round the Eiffel Tower in his Typhoon led to some correspondence in *Flight*, who dived with his section to make a low-level attack with the fused bombs. Flt. Lt. Wallace, who came in immediately behind in the second wave of low-level bombers, said he definitely saw two of the bombs from the first wave actually enter the side of the house. Such a cloud of débris went up that he could no longer see the target and had to aim in the middle of the smoke. From this point the rocket Typhoons took on the job, and the remaining débris was finally ground to dust by the dive bombers. The farmhouse was situated near the cross-roads which lead to St. Martins, D'Aubigny, St. Michel de la Pierre and Les Mesnilbus. At the cross-roads a church stands on the opposite corner. It was not possible to see any damage to its structure. The whole attack appears to have been of textbook quality.

Rocket projectile Typhoons, four of which helped in the attack on the German Army Corps headquarters.

CLOSE UP

June Effort

The pre-invasion "softening-up" by the combined air forces over the Continent is now paying a handsome dividend. Prisoners are complaining of lack of petrol and ammunition, and enemy divisions arrive in the fighting line short of various elements.

Unprecedented bad weather prevents us from taking full profit from our air supremacy. Yet the figures for sorties and tonnage of bombs for June show a sharp rise over those for May. Air Chief Marshal Sir Leigh Mallory's A.E.A.F. alone flew over 90,000 sorties. Some 24,000 of these were made by the 2nd Tactical Air Force, and approximately 25,000 by fighter bombers of the 9th U.S.A.A.F. Nearly 25 per cent. of the total sorties were flown in order to maintain air cover over the landings and convoys.

Attacks on ground targets accounted for more than 1,000 military road vehicles, 100 armoured vehicles and several hundred loaded railway trucks. In addition, many direct attacks were made on targets selected by the Army.

The 2nd T.A.F. lost 247 aircraft and the 9th U.S.A.A.F. 237 aircraft. In the sporadic appearances put in by the *Luftwaffe* and in attacks on German airfields 373 enemy machines were destroyed.

BOMBER COMMAND V.C.

THE KING has been graciously pleased to confer the **Victoria Cross** *on Pilot Officer Cyril J. BARTON, R.A.F.V.R., No. 578 Squadron, in recognition of most conspicuous bravery.*

ON the night of March 30th, 1944, Pilot Officer Barton was captain and pilot of a Halifax aircraft detailed to attack Nuremburg. When some 70 miles short of the target, the aircraft was attacked by a Junkers 88. The first burst of fire from the enemy made the intercommunication system useless. One engine was damaged when a Messerschmitt 210 joined in the fight. The bomber's machine guns were out of action and the gunners were unable to return the fire.

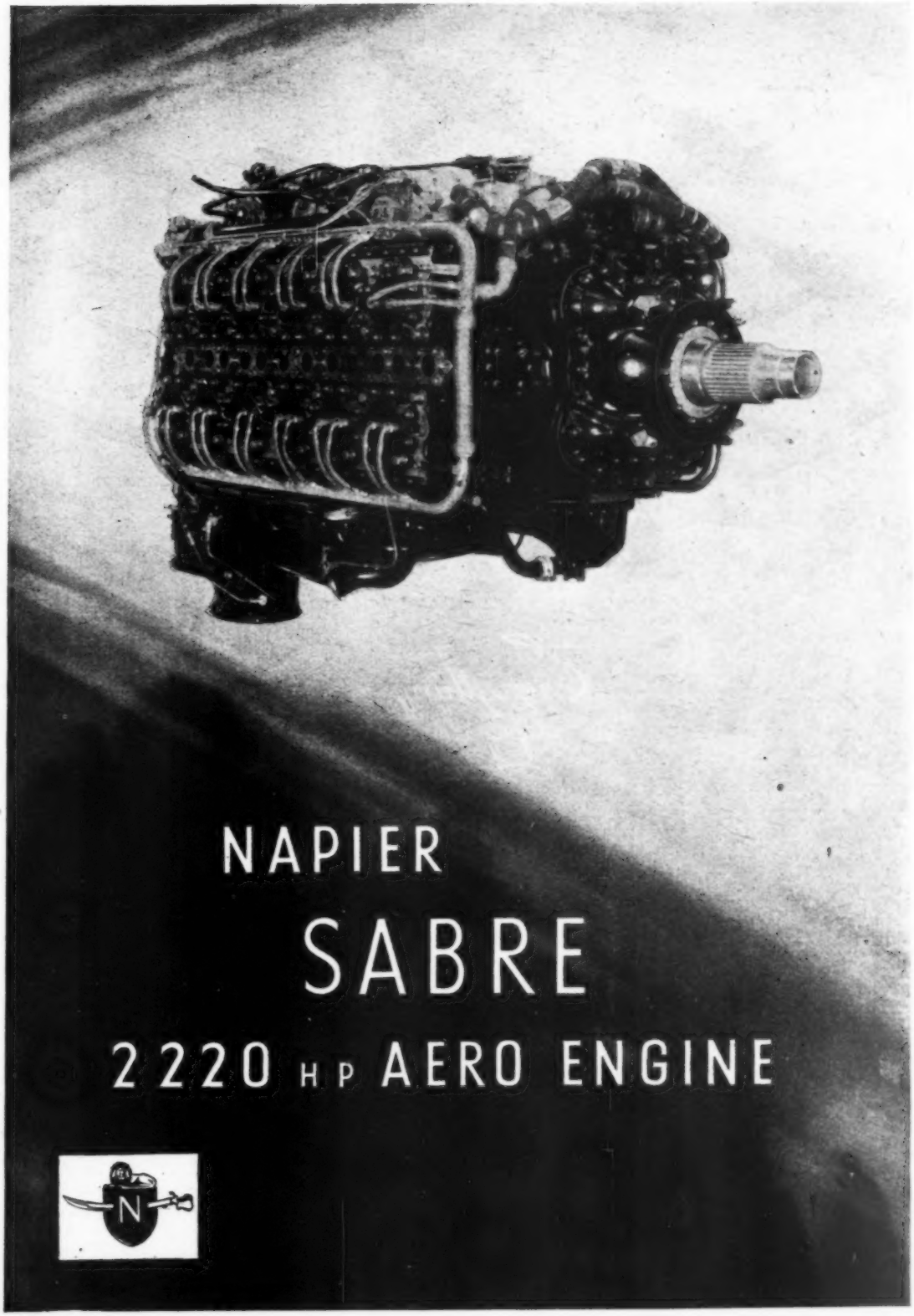
Fighters continued to attack the aircraft as it approached the target area and, in the confusion caused by the failure of the communications system at the height of the battle, a signal was misinterpreted and the navigator, air bomber and wireless operator left the aircraft by parachute.

Pilot Officer Barton faced a situation of dire peril. His aircraft was damaged, his navigational team had gone and he could not communicate with the remainder of the crew. If he continued his mission, he would be at the mercy of hostile fighters when silhouetted against the fires in the target area, and if he survived he would have to make a 4½ hours' journey home on three engines across heavily defended territory. Determined to press home his attack at all costs, he flew on and, reaching the target, released the bombs himself.

As Pilot Officer Barton turned for home the airscrew of the damaged engine, which was vibrating badly, flew off. It was also discovered that two of the petrol tanks had suffered damage and were leaking. Pilot Officer Barton held to his course and, without navigational aids and in spite of strong head winds, successfully avoided the most dangerous defence areas on his route. Eventually he crossed the English coast only 90 miles north of his base.

By this time the petrol supply was nearly exhausted. Before a suitable landing place could be found, the port engines stopped. The aircraft was now too low to be abandoned successfully. Pilot Officer Barton therefore ordered the three remaining members of his crew to take up their crash stations. Then, with only one engine working, he made a gallant attempt to land clear of the houses over which he was flying. The aircraft finally crashed and Pilot Officer Barton lost his life, but his three comrades survived.

Pilot Officer Barton had previously taken part in four attacks on Berlin and 14 other operational missions. On one of these, two members of his crew were wounded during a determined effort to locate the target despite appalling weather conditions. In gallantly completing his last mission in the face of almost impossible odds, this officer displayed unsurpassed courage and devotion to duty.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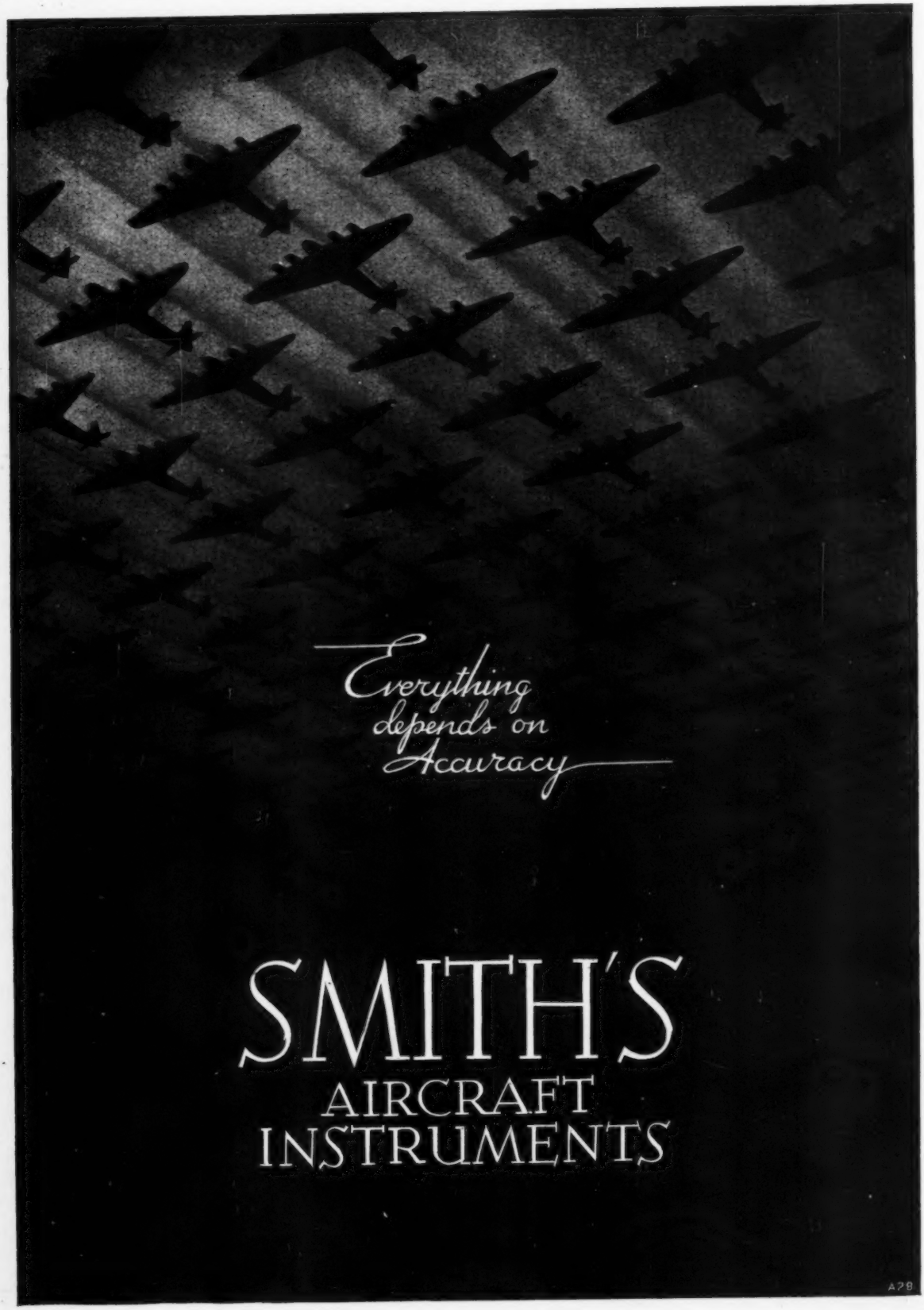

Everything depends on Accuracy
SMITH'S
AIRCRAFT INSTRUMENTS
A28

Indicator Discusses Topics of the Day

Retreat to Rationalism—I

The Price We Pay for Sheer Efficiency : Simplification Necessary for Peace-time Economic Conditions : Misguided Ingenuity : To-morrow's Power Unit

I OFTEN wonder what the aircraft engineer of twenty-five years ago would make of the present-day contraption. Faced with the thing indoors, at an Aero Show, for instance, he just wouldn't believe that it would fly at all, and, even if he could be convinced of that, he would be horrified by the sheer complication of it all. And if one spent a few days going round the details with him, explaining how one complication led to another, he might finally believe in it and be very impressed by the ingenuity of those who thought it all out, but he would still give it only about half an hour's flying before something went wrong. He would very soon realise, too, that its flying has only been made possible by the immense reserve of power available.

As for his half-hour limit, he would not, in true fact, be so very far wrong, since nearly every flight produces a minor snag of some sort and every inspection brings some little fault to light. That is the price we pay for performance, but the price is very much lower than anyone could possibly have imagined even ten years ago. Nevertheless, the price is a very real one. At the moment, in war conditions, with cost no object and a very fair supply of necessary man- and woman-power, it is worth while, but the time will come when aircraft must, to use an American constructor's expression, be "simplicated" in order to "add more lightness" and more reliability. We just cannot go on along the present lines, and I sometimes think it will be necessary to go right back and start again.

Cost Reduction Essential

Of course, the things *work*, and they'll become more and more reliable in detail, but initial maintenance and running costs must be reduced tremendously if fares and/or subsidies are to come down to figures which will make an aircraft anything like a commercial peacetime proposition. At the moment I can visualise the present-day type of aircraft being reasonably profitable if an airline is operated on a gigantic scale, with initial orders sufficiently large to bring costs down almost to war-production levels (but without the war-production wastage and carelessness), and with services sufficiently frequent to make possible the economic employment of a vast army of maintenance and operating people working at maximum efficiency.

And that means, to all intents and purposes, State-ownership, whether we like it or not. Speaking generally, people don't like it. Quite apart from any principles of *laisser faire*, no State-owned project is likely to be really efficient. Oh, I know about the Post Office, but it is simply a fact of individual psychology. The man or woman with regular work, a regular and unchanging salary, and a certain pension to look forward to, has little incentive to work any harder than necessary. You can see the results for yourself in any Civil Service in the world—or, for that matter, in any fighting service which isn't either at war or preparing for war.

In an ideal world, with ideal people, State-ownership of more or less everything would no doubt be a good thing, but, human nature being what it undoubtedly and unhappily is, we must think in terms of compromises. At least, until airlines prove themselves to be a prospectively paying proposition, the financial weight will need to be carried by the State, with its enormous resources, and means will have to be found of removing any traces of the dead-beat Civil Service effects on efficiency of operation. I have a feeling that the operation of an airline might be of sufficient interest, and be permanently exciting enough to prevent the "settled" feeling from settling on those who have any part in it—other than those who are sitting uninterestingly at home in traffic offices. But the best results in any such new enterprise will always be obtained by controlled private enterprise, and I can't feel that private enterprise can be expected to make a success of airline operation while the aircraft concerned are so infernally complicated and expensive to operate.

Without belittling the extraordinarily ingenious efforts of the designers of present-day airframes and engines, or even being too reactionary, I still feel that we've got to go backward before we can go forward again with reasonable hope of success in a competitive and matter-of-fact world wherein prospective air travellers are not all wealthy tourists, or business men who are directly and indirectly subsidised.

There may or may not be a radical change in the general design of aircraft during the next ten years, but there must and will be a change in the type of power unit used to propel this aircraft. The more one examines the present-day reciprocating aircraft engine the more magnificent does it appear as an engineering achievement by which a high power-weight ratio is obtained in the face of almost insuperable difficulties and with such enormous and inevitable losses to be made up. In engine design, one thing simply leads to another, the returns on the roundabouts, so to speak, leading that from the swings by a small margin all the time.

I won't enlarge on the wasteful complications of the multi-cylinder four-stroke internal combustion engine, or on the inefficiencies of any alternative two-stroke unit. In order to make a suitable series of explosions and to convey the power impulses obtained to the airscrew, some seventy-odd gear wheels are used to reduce airscrew speed, drive the impellors, work the camshaft and operate the constant-speed unit, and make those subsidiary but entirely necessary drives to the oil pumps, fuel pumps, hydraulic pumps, vacuum pumps, air pumps, electric generators, coolant pumps, magnetos and revolution counters.

Swings and Roundabouts

The impellor is the perfect example of the roundabout and swing business; it may cost you just 200 h.p. to drive the thing, but it is paying a worthwhile dividend if one gets 300 h.p. in return. And the carburettor is the perfect example of how one complication leads to another. Admittedly, it doesn't have to be driven and it doesn't weigh so very much in proportion to the overall weight of the engine, but it is complicated and expensive—a hive of pressure aneroids, piston valves, pumps, and mechanical or other compensating devices. Half a dozen jets must be organised to provide the right sort of explosive mixture from slow running to full power, and to make up for deficiencies in different conditions of running and throttle opening. Any carburettor which works satisfactorily is a monument to the ingenuity and persistence of the human race.

The moment always produces the man and the need nearly always produces the invention. The aircraft engine as we know it now has very nearly reached its final stage of development, and a simpler means must be found of transforming the incipient power of an explosive mixture into useful propulsive effort. Although it may seem an obvious thing to make the force which pushes a lot of pistons down do the job directly instead of through an airscrew, it is not, unfortunately, quite as simple as all that. A jet of any kind is by no means the most efficient way of driving anything at much less than supersonic speeds. If this were not so, why should marine engineers

RETREAT TO RATIONALISM

have taken the trouble to instal engines, when all they really needed to do was to direct the steam from the boilers out of a jet at the back of the vessel? And, as every engineer knows, the jet-propulsion story is really the least interesting feature of the recently published developments. The important thing has been the gas-turbine. People have been trying for a very long time to make them work, and now, it seems the problems of overheating and lubrication have been largely solved by the metallurgists and others.

We may get jet-propelled aircraft for special purposes in this war, and we may get them later for high-altitude, long-distance aircraft, but the next move in the "simplification" of aircraft will, I think, be the use of the altogether simpler and eventually more efficient "rotary converter" as a power unit, driving, for the present, the common or garden airscrew. The shape, size and characteristics of this form of power unit, coupled with the subsidiary jet effects—which might be used for control purposes—will probably alter all our ideas of aircraft design. That remains to be seen, but at least we can look forward to considerable changes.

INDICATOR.

Ubiquitous W.A.A.F.s

How the Women's Auxiliary Air Force Has Grown in Five Years

THE Women's Auxiliary Air Force celebrated its fifth birthday on June 28th. This vigorous five-year-old has grown out of all proportion since the outbreak of war, and the number of trades in which airwomen are employed has increased from five in 1939 to more than 70 in 1944.

This gives some idea of the growth and importance of the women's section of the R.A.F. One has only to visit any air-field or other R.A.F. establishment in Britain and speak to the men who serve there to appreciate fully the work which the women in Air Force blue are doing, and the confidence that is placed in them. One has also to go farther afield, for members of the W.A.A.F. are now serving in various parts of North and East Africa, in Egypt, Palestine and Aden, in Italy and Malta, in Bermuda, the U.S.A. and Canada, and in the South-East Asia Command.

Local recruiting around a nucleus of officers and airwomen from Britain has transformed the W.A.A.F. overseas into an international sisterhood. Writing from her station in the Middle East, a W.A.A.F. says: "Apart from officers and airwomen from home, from South Africa, Kenya, Tanganyika, Uganda and Rhodesia, there are representatives of all Allied nations and free peoples. There are Americans, Dutch girls, Belgians; there are girls from Malta, Cyprus and Greece—and an English girl brought up in China.

"There are several hundreds who volunteered in Palestine; some from Russia and Latvia, and others who are refugees from Poland, Czechoslovakia, Rumania, Austria and Yugoslavia—all talking in a medley of tongues and accents, and flipping casually from one language to another. Roll call finds English N.C.O.s struggling valiantly with such names as Dermonsoniades, Benhyphen, Jaakov, Yerolemou, Miaouli."

The W.R.A.F.

By the end of the last war about 32,000 women had served with the W.R.A.F., and more than 300 of them went overseas with the British occupation forces in the Rhineland—figures of home and overseas service which have long ago been surpassed. When war ended the W.R.A.F. was demobilised. On June 28th, 1939, the W.A.A.F. was formed, and in the following month Air Commandant K. J. Trefusis Forbes (now Air Chief Commandant Dame Katherine Trefusis Forbes, D.B.E.) became director, to be succeeded in October last year by Air Commandant Lady R.M.E. Welsh.

In 1939 the trades open to airwomen were mainly domestic and clerical, but now the more than 70 trades include many of a highly skilled nature which at one time were considered unsuitable for girls. More and more the force's responsibility has grown, and girls have always been equal to the demands.

About 4,000 W.A.A.F. officers have now taken the place of R.A.F. officers. More than 300 hold responsible staff appointments at the Air Ministry, and some hundreds of officers are employed on intelligence, signals, catering and administrative duties abroad. W.A.A.F. officers accompanied the Prime Minister to conferences at Casablanca and Ottawa, and also went to Marrakesh.

It is estimated that at least 95 per cent. of the airwomen are directly replacing airmen, and 70 per cent. of them are in skilled trades. In Balloon Command a scheme has been inaugurated for a W.A.A.F. Flight Sergeant at each flight headquarters to inspect balloon sites, both from a technical and administrative point of view, and to give instructions for routine technical adjustments.

Many of these girls are in the closest contact with the war in the air—plotting the tracks of enemy bombers and of our fighters who intercept them, giving landing instructions to Lancasters, Halifaxes, Wellingtons and Mosquitoes returning from the great attacks on Germany, working in the operations rooms, or on the airfield itself, at take-off and return of aircraft.

Others work behind the scenes, filling ammunition belts, testing sparking plugs, packing parachutes, inspecting and maintaining engines, developing photographs and repairing cameras, operating telephones and teleprinters, serving in the mess, repairing fabric on balloons or aircraft—and so the list goes on, through a great variety of jobs, and each one of them important to the war effort.

Meteorology is one of the "trades" in which girls have proved their efficiency. They work on operational stations and in Flying Training Command, drawing up charts from weather observations they have themselves taken, and explaining their forecasts. With the exception of a few R.A.F. officers, all the meteorological officers in Flying Training Command are W.A.A.F. They brief the crews about the weather, and frequently fly to assist pupil pilots to make meteorological tests.

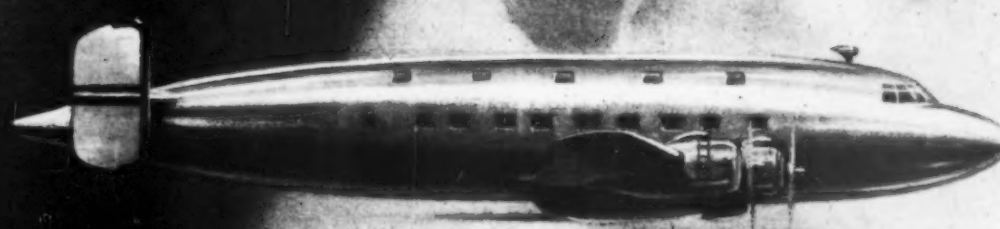
The first all-W.A.A.F. salvage team has recently been formed, and its success has prompted the substitution of girls for men on salvage work wherever possible. They tackle anything, from a Tiger Moth and Spitfire to a Lancaster or a Fortress. Much of their time is spent dismantling enemy aircraft which have crashed in this country. They carry out all sections of the work, except jacking the aircraft into a safe position and removing the guns, ammunition and unexploded bombs.

Another record which has been set up by the W.A.A.F. is the staffing almost entirely by girls of an Equipment Park, with a W.A.A.F. commanding officer who holds the rank of Squadron Officer. These parks are small units which hold stocks of aircraft and other equipment for rapid distribution to all airfields within a particular area, whether bomber, fighter, coastal or training.

In a variety of ways the W.A.A.F., at their fifth birthday, have built up a great record of service and versatility. Their work alongside the R.A.F., of which they are an integral part (they were granted Air Force status in 1941 and declared to be members of the armed forces of the Crown) has received praise from every quarter. Forty-five members have been decorated, and 697 have been mentioned in despatches.

APPRECIATIONS

On the "birthday" many messages of congratulation and appreciation were received by Air Commandant Lady R. M. E. Welsh, Director of the W.A.A.F. Her Majesty The Queen sent one to express her admiration for the devoted service which the force has given from its earliest days. H.R.H. Air Chief Commandant the Duchess of Gloucester said in her message, "I have been filled with pride at the way in which you have shouldered your responsibilities." Marshal of the Royal Air Force Sir Charles Portal, Chief of the Air Staff, said: "Manifold and onerous duties have been discharged with a zeal and efficiency which have won for the W.A.A.F. a universal admiration and have been an invaluable contribution to our military successes."

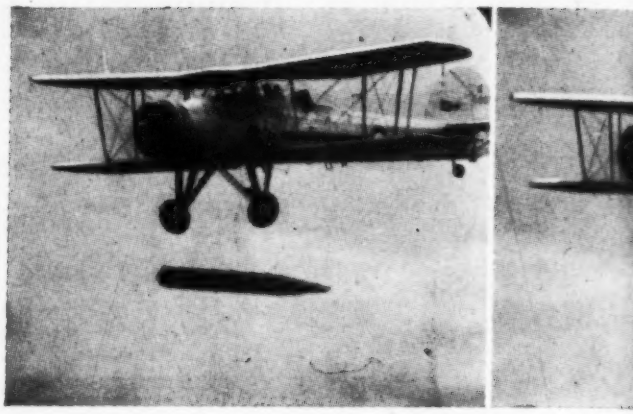


HANDLEY PAGE

HANDLEY PAGE LIMITED, LONDON, ENGLAND

Passing of a Famous Biplane

Some Swordfish Exploits Recalled: How Group Manufacture Helped Allied Sea Power



FULL-SCALE production of one of the war's most successful operational aircraft is now being tailed off to make way in the factories for new aircraft coming forward in increasing numbers for the Fleet Air Arm. The reduction in output, progressing stage by stage, will ultimately terminate the remarkable run of the Fairey Swordfish, though numerous units in service in the Royal Navy may be expected to continue its use for long to come and in widely separated places throughout the world.

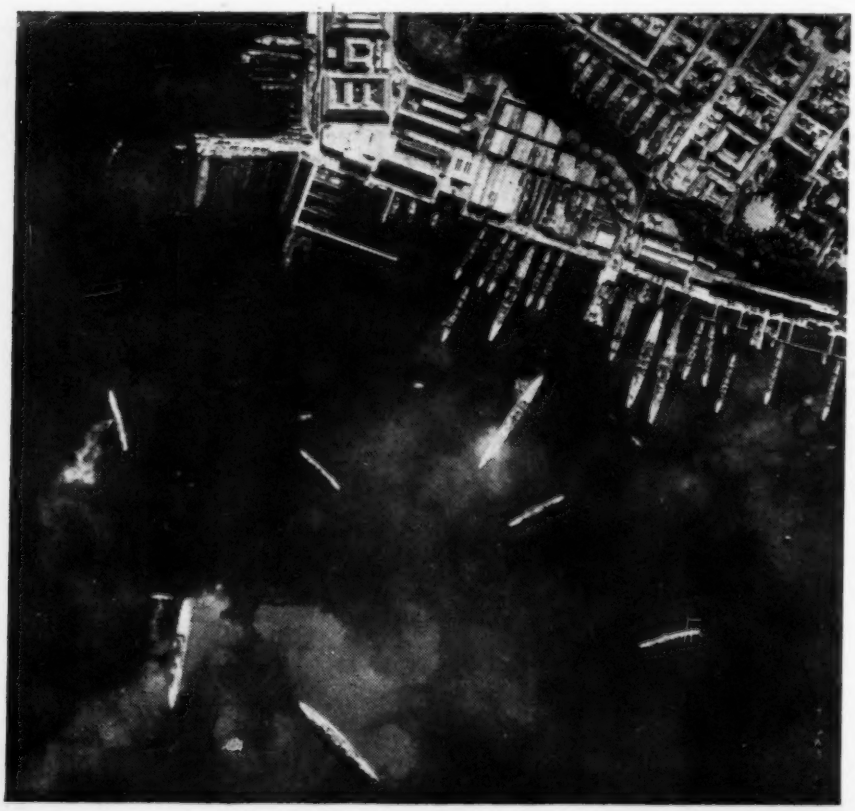
The decision to tail off production may, in the changing circumstances of war, even now be revoked; for the Swordfish, as an obsolescent biplane, has more than once been adapted to counter some enemy innovation or to bear some new operational device such as the rocket projectile. Before it disappears altogether from the picture of British aviation it is therefore fitting that a tribute should be paid to an aircraft type which has given faithful service in spite of the scorn that has sometimes been poured upon it by those who have judged it by superficial externals rather than by its true merits.

The Swordfish began its career in 1934 as an experimental T.S.R. type. For the benefit of younger readers it may be explained that these letters denoted the three main alternative duties for which the type was designed: torpedo-carrying, gunnery spotting, and reconnaissance. A crew of three had to be carried, and in addition to the special equipment demanded by these three main functions, the machine had spools for catapulting, and deck arresting gear. All this was expecting quite a lot from an aircraft with a single Pegasus engine of 750 h.p., and it is scarcely surprising that the performance was not spectacular. The Swordfish was used fairly extensively before the outbreak of war.

Need for increasing Swordfish production by transferring it to other works arose from full-scale production of the Fairey Albacore in the Fairey shops. The Albacore was then a new type, and the Fairey Company saw proper reasons against surrendering it from their immediate supervision. Furthermore, much time would have been wasted had Albacore jigs and tools been shifted to distant works during the height of the air attacks on Britain.

First continuation order came when the priority on the Fairey Barracuda torpedo bomber was set back in 1940 and its delivery to the Fleet Air Arm consequently delayed by more than two years. It was early in 1940 that Captain (now Commodore) M. S. Slattery, R.N., then Director of Air Material at the Admiralty, proposed to Mr. Robert Blackburn, chairman and joint managing director of Blackburn Aircraft Ltd., that his firm should build the Fairey Swordfish. At that time the existing production capacity of the Blackburn factories was already engaged up to the hilt, but the plan eventually agreed upon involved the building of new production and assembly factories and the organisation of a Group under the ægis of the Blackburn Company. This scheme was an echo of aircraft production methods in the last war, in which Mr. Robert Blackburn had undertaken the organisation of Group production by firms mainly in the Yorkshire and Lancashire areas.

Many firms engaged in Swordfish manufacture and construction in 1940 had no previous knowledge of such work, but the major components (wings, fuselages, under-



THE BIGGEST JOB: The crippled Italian fleet in Taranto Harbour after a torpedo attack by Fleet Air Arm Swordfish.

IN THE CAMERA'S EYE: A sequence of shots from a ciné camera showing a Swordfish dropping its torpedo.

carriages, etc.) were split up among firms which rated as Group members. They were not termed sub-contractors because their combined efforts and cumulative co-operation were required to make the scheme a full success. Their responsibilities marched parallel with the major unit.

In the Blackburn Group were four prime factor "daughter-in-law" firms, and behind them hundreds of major and minor sub-contractors. It was the Group's task to organise production from all these units—to which must be added the Pegasus engines from the Bristol Aeroplane Co. and the numerous items of Embodiment Loan supply. The Group system required this manifold output to be channelled and synchronised into one smooth-flowing production assembly line. On top of the actual complete aircraft, a commitment of 60 per cent. spares had also to be made.

Shifting a Whole Factory

The ramifications of the Group ensured geographical dispersal against knock-out blows by enemy air attack but hazarded the success of the scheme since any one failure could affect the whole. This, in fact, occurred when one of the main daughter-in-law units failed through inexperience to meet its programme. To overcome this an urgent conference with Lord Beaverbrook and Sir Charles Bruce-Gardner (representing the production side of the newly-formed Ministry of Aircraft Production) resulted in an eleventh-hour change. The whole of one daughter-in-law firm's works was shifted, with all its labour force, work benches and partly finished components, to the main Blackburn erection shop. The bottleneck in production was thus energetically and enterprisingly removed. The exodus from the Group member's works to the Blackburn unit was made with generous co-operation on both sides, to such effect that the production was in full swing after only seven days—a truly astonishing feat of organisation.

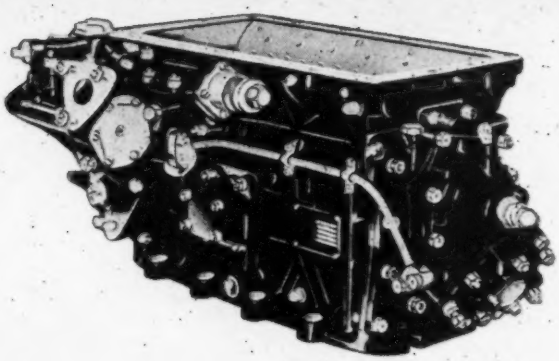
One feature of this Group system was its elasticity. The original function of the Swordfish was, as already mentioned, a torpedo-spotter-reconnaissance aircraft, but development of new weapons caused new operational work for it. To incorporate the new equipment, structural and other modifications to the original machine were introduced "on the line," i.e., without checking the outflow of aircraft.

A start was made on the central assembly factory in January, 1940, and in less than 11 months from the laying of the foundations in a cornfield the first Blackburn-built Swordfish came off the line. In fact, despite a rigorous winter, the factory was ready by June, 1940, and a month later the detail components for the assembly lines had started to flow in from other factories in the Group. The Fleet Air Arm, noted for its ability to ticket its products, promptly named the new aircraft "Blackfish."

The initial order for a few hundred aircraft was followed up by repeat orders, and the programme was stepped up month by month as the Group got into its stride and made astonishing increases in output.

The demand for more Swordfish and increased Blackburn output arose from the operational successes. In 1941, mainly because of merchant shipping losses, there was an urgent call for anti-submarine weapons. In this connection

LE DERNIER CRI: For some while the Swordfish has been adapted to take the modern rocket projectile weapon.



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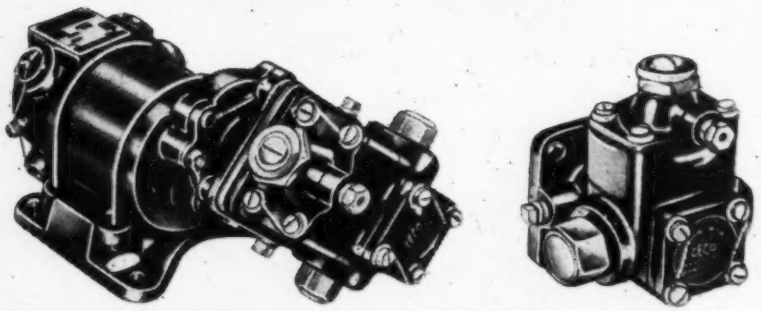

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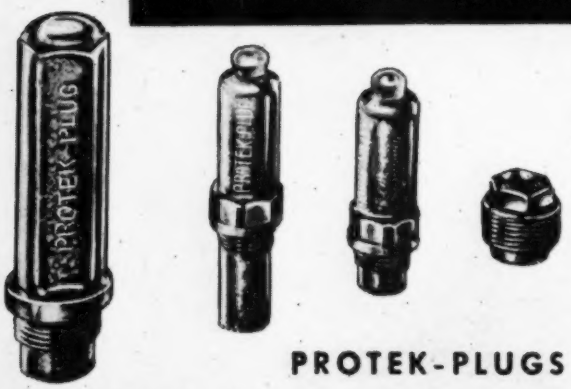

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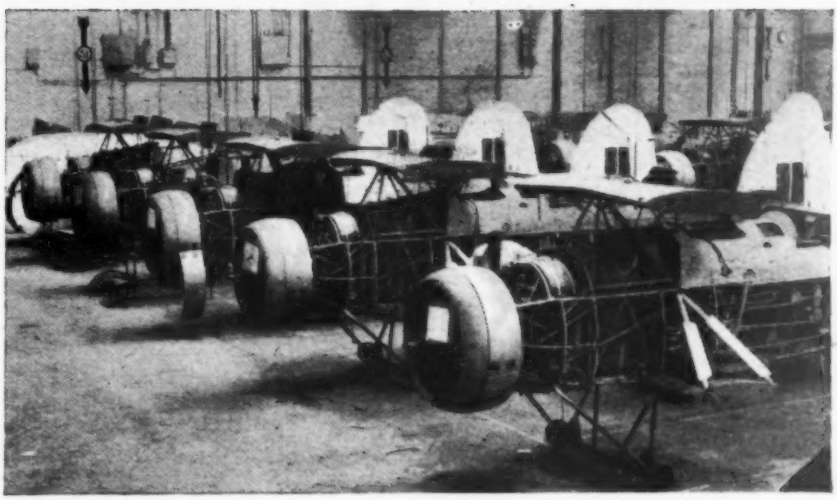
PASSING OF A FAMOUS BIPLANE



Part of the Swordfish production line in one of the Blackburn factories.

many escort carriers then building relied upon Swordfish production. By that time these aircraft had figured in many faraway campaigns; in Norway; in the Lowlands; at Oran; in the brilliant naval victory at Taranto, where a couple of Swordfish squadrons crippled Italian sea power for negligible losses; in the campaigns of Greece, Crete, Syria and Cyprus; in the second major naval air victory at Matapan; and throughout the campaigns in the Western Desert from Mersa Matruh to Benghazi; at Malta; and had played the leading role in trapping and destroying the *Bismarck*.

Fruits of the production effort began to be gathered in the wider, and more strategically important, Battle of the Atlantic. In May, 1942, after taking part in the successful domination of Madagascar, the Swordfish operated from an escort carrier in the destruction and serious damage of numerous U-boats which were attacking by pack methods our shipping supply lines. From that date the U-boat sinkings in the Atlantic dropped sensationally and have never recovered—though the function of the Swordfish was rather to seal the "gap" in mid-Atlantic which the very long-range aircraft could not cover from shore bases.

Numerous remarkable feats have been performed by the Swordfish outside its designed tasks of torpedo-bombing, bombing, depth-charge attack and general reconnaissance duty. It took part in leaflet raids on North African Vichy towns; landed British agents behind the lines in Tunisia; served as a maid-of-all-transport-work to Fleet Air Arm squadrons in the Western Desert (including delivery of personnel, spares, stores, ammunition and provisions). In its torpedo slings a motor bike was flown from the R.N. base at Hyères, S. France, to Alexandria. On one occasion, such was the shortage of aircraft in the Eastern Mediterranean that Admiral Sir Andrew Cunningham, General Wavell and his Staff Colonel had to stand in the back of a Swordfish from Alexandria to Cairo. Frequently as many as five passengers have been crowded into the back seats—designed to carry two.

It is on record that after A.A. fire had badly damaged a lower wing of one Swordfish, ripping off most of its fabric, the pilot landed, deliberately stripped the fabric from the other wing and then, having dumped all movable gear, flew back to base in part-monoplane form. As an indication of its sea striking power, during one period of months Swordfish based at Malta sank an average of more than 50,000 tons of shipping per month, and despite bitter enemy attacks against the island airfields, sank 98,000 tons in the peak month. Widespread success has also been achieved on mine-laying operations.

Less conspicuously the Swordfish has performed yeoman service in training. Many hundreds of air gunners have practised air firing from its rear seats—one Old Faithful at a naval air station is credited, after many months of active war service, with having been the flying platform for more than 1,500 air gunners, who fired more than a million rounds of ammunition from it. In addition, Swordfish have been extensively used for warship gunnery training, towing a sleeve target some 6,000ft. astern for ship practice shoots. They have also been the "target for tonight" in hundreds of searchlight exercises, and by flare-dropping at Western Desert enemy bases in 1940-41 can be said to have pioneered Bomber Command pathfinder technique.

From the initial production equivalent of 22 aircraft per month, output has progressively risen steeply to establish Backburn's as a foremost British production organisation. A stage came, however, when the Fairey Barracuda took over on operations many of the duties performed by the Swordfish through the years of endurance. Blackburn's success with Swordfish production made them the obvious choice when large-scale production of the Barracuda was demanded, and they accordingly have tailed off their Swordfish production to give factory space to the successor of monoplane design.

The impending demise of the Swordfish closes a memorable chapter of biplane construction in the history of British aeronautics, though it should be remembered that stalwart work is still being performed by the Vickers Walrus and by de Havilland biplanes on training duty. Last of the fully operational biplanes, the Swordfish has behind it a brilliant war record in its category, and its affectionate nickname of "Stringbag" will be remembered long after other less enduring types are forgotten.

POST-WAR INDUSTRY

TOUCHING upon post-war conditions in his statement to shareholders at the annual general meeting of Hawker-Siddeley Aircraft, Mr. T. O. M. Sopwith referred to the need for maintaining a strong Air Force, the great scope for civil air transport, and the importance of Commonwealth equipment being at least equal technically to any other. The Hawker-Siddeley group was in a position to take advantage of any opportunity that might offer. Certain establishments would no longer be required, and consideration would be given to any sound proposals for utilising this surplus capacity, but the board had at present no intention of embarking upon any venture detrimental to their established peacetime activities, or of entering into competition with already well-established industries.

Referring to the statement by the Minister of Production concerning the output of 90,000 aircraft up to the end of last December, Mr. Sopwith said that of this total no less than 27 per cent. were produced by companies in the Hawker-Siddeley Group.

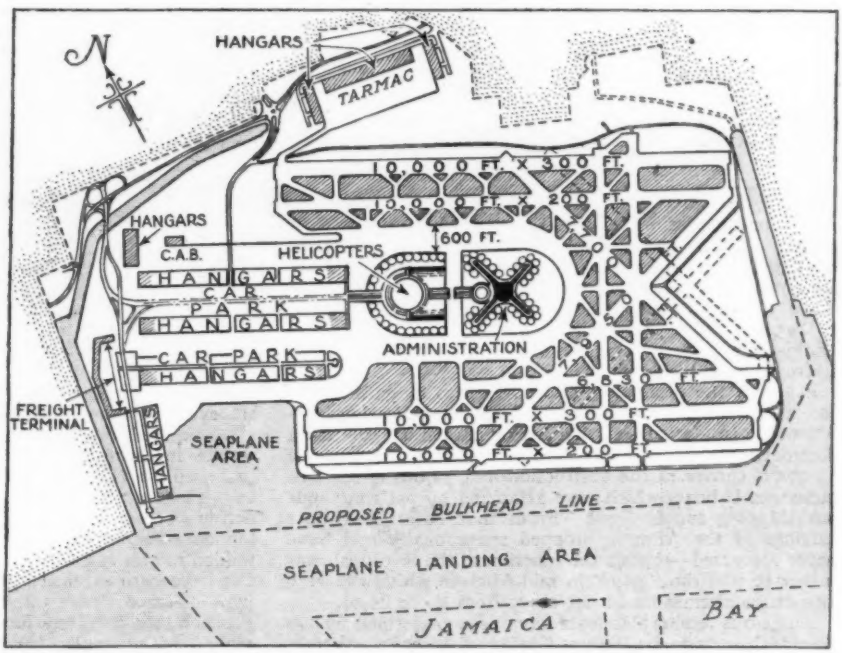
Of the new types made by the operating companies in the Group, Mr. Sopwith said that the Albemarle, a glider-towing freighter type, had been in operation in Sicily and now in Europe. The Tempest had maintained the same superiority as had the Hurricane and Typhoon, and the York had proved one of the most reliable transport types for all purposes. "I look forward," Mr. Sopwith said, "with confidence to the début of the York and its sister types on the more important commercial routes under post-war conditions."

Idlewild Airport

New York's New Municipal Airport Expected to Handle 360 Aircraft an Hour : Special "Blind Landing" Runways 300ft. Wide

COVERING a site totalling 3,276 acres, the new municipal airport for New York, now under construction at Idlewild, is intended to accommodate not only present-day aircraft, but the largest and heaviest transoceanic and transcontinental types which can be foreseen during the next ten years.

Situated on Jamaica Bay, the site is only 16 miles from New York Grand Central terminal—reckoned a 35-minute motor car journey—but the construction of the airfield has entailed the hydraulic filling of an area of tidal marshland and the planning of a somewhat elaborate drainage system for the runways and other paved areas which total 4,700,000 square yards of concrete and cater for loads up to 75,000 lb. per wheel. The cost of this impressive undertaking, exclusive of actual buildings, is put at $45,500,000. The hydraulic fill consists of sand dredged from the bay, and this has been removed in such a way as to obtain at the same time a seaplane landing area 13,000ft. long and 1,750ft. wide. Some 26,000,000 cubic yards of this hydraulic fill have been placed up to now, but another 39,000,000 will be required before the job is finally completed, making it the biggest operation of its kind ever undertaken in America.



CONCRETE "GEODETICS": This sketch plan of Idlewild Airport shows the multiplicity of taxiways designed to give maximum traffic capacity to the nine runways. The helicopter park appears to be some 600ft. in diameter.

Increased Traffic Capacity

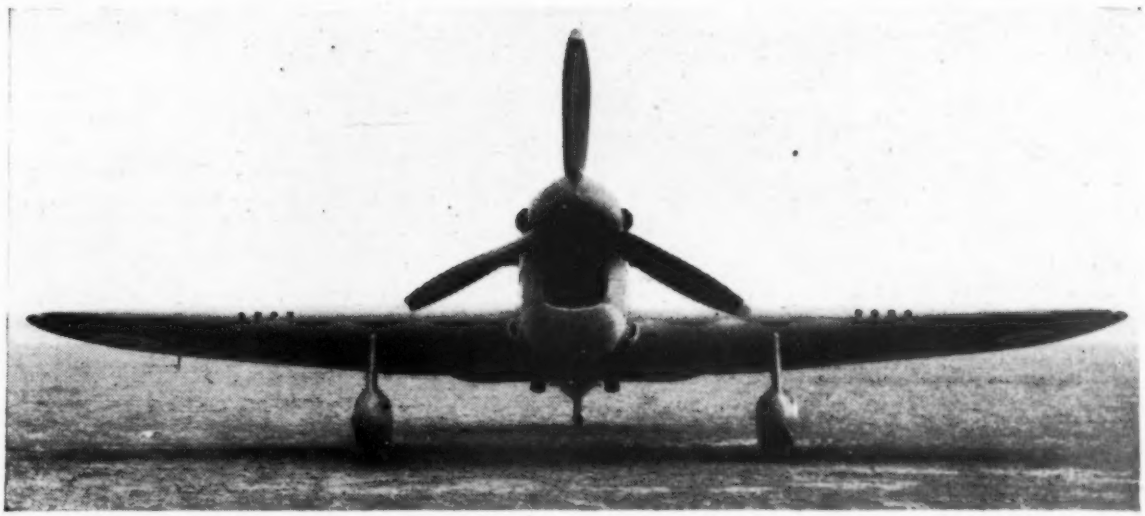
Reference to the accompanying sketch plan shows that nine runways in all are to be provided. These are served by an unprecedented number of taxiways giving the complete layout a positively "geodetic" appearance, but there is a very practical object behind this apparent prodigality in concrete; they will materially increase the traffic capacity of the runways. Aircraft landing can promptly taxi off the runway, generally at 45 degrees, thus quickly clearing the runway for following aircraft. Similarly on taking off, aircraft will warm up on a taxiway and there await the green signal on receipt of which they will taxi out on to the runway and take off straight away. Thus the time each aircraft actually occupies the runway will be reduced to the absolute minimum. By this method it is calculated that the five parallel runways constructed along the direction of normal operation should be able to accommodate 360 aircraft movements per hour.

A brief reference to the runway pattern will be of interest. It is based on a careful study of the wind rose in this locality and the observed velocities and distribution over a period of several years. It also takes into consideration the experiences of present wartime practices as regards out-of-wind take-offs and landings and the increased tolerances permitted by the tricycle undercarriage. But while planning its volume operations for multiple runways in two directions, it provides for landings which will not exceed 22½ degrees off-wind where required. The U.S.A.A.F., it is stated, habitually lands its heavier aircraft at anything from 45 degrees to a full 90 degrees off-wind. Experience has shown, however, that even if all winds up to 15 m.p.h. are included, no less than 76½ per cent. of landings and take-offs can be made on the main runways without exceeding 22½ per cent. off-wind operation. Allowing 45 degrees off-wind up to 30 m.p.h., and 90 degrees up to 20 m.p.h., more than 90 per cent. of all movements will eventually be made on these main runways, four of which are 10,000ft. long. Two of these (as indicated on the sketch) are 300ft. wide, all the rest being 200ft., and it is intended that the three parallel runways on the south side will be used for landing, and the two on the north side for take-offs. The two 300ft. wide runways, which are a mile apart, will be available for simultaneous blind landings when conditions make this necessary.

The loading apron extends around the entire administration building area. It is 800ft. wide, and can comfortably deal with 50 aircraft at a time.

The total length of runways will be 14.4 miles, and the total length of intersecting taxiways 6.5 miles, and together they represent 2,050,00 square yards of concrete 12in. thick. Concrete in loading aprons measures another 1,200,000 square yards, and the full development of 38 hangars with their aprons adds another 1,450,000 square yards of concrete. Altogether this calls for no fewer than 2,500,000 barrels of concrete. Length of drains totals 28½ miles.

London's new civil airport near Staines, the layout of which is being planned by the Air Ministry's own architect, and upon which work has already begun, will cover an area of 2,800 acres.



The Miles M 20 fighter with Rolls-Royce Merlin XX. Eight machine guns in the wings.

New Fighter in Nine Weeks

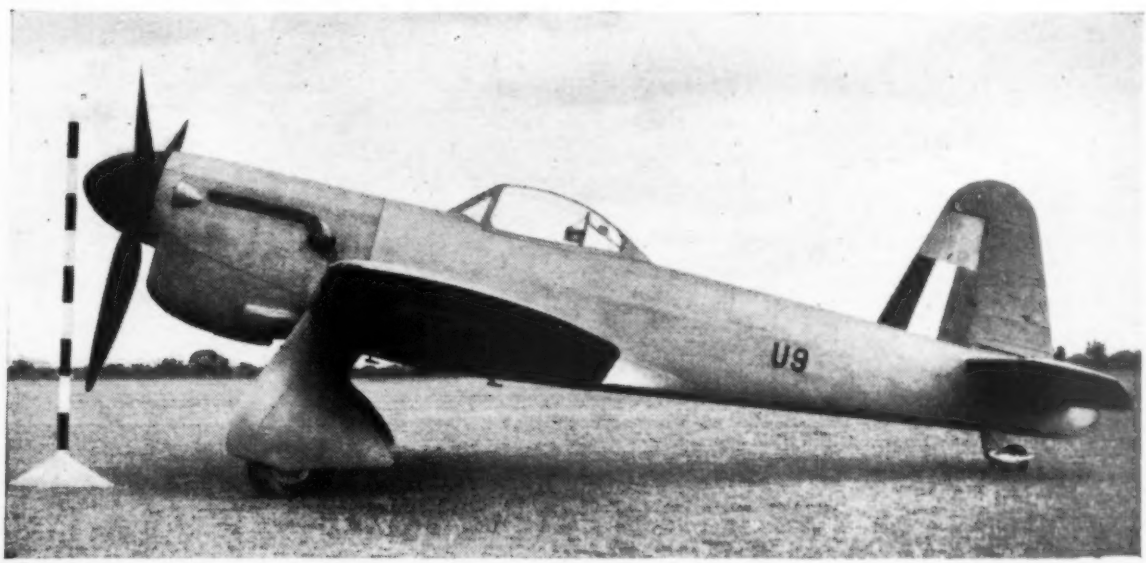
Drastic Measures in Production of the Miles 20

AVIATION history records that in August, 1914, Mr. Noel Pemberton-Billing designed and built a single-seater biplane "scout" in seven days. Miles Aircraft, Ltd., has not quite equalled that record, but in 1940 the firm did produce an all-wood, single-engined, single-seater fighter in nine weeks and two days. In the Battle of Britain there was a risk of running short of fighters, and the company approached Lord Beaverbrook with a project. It was accepted and instant authority to go ahead was given. After the interval mentioned the first flight was made by the Miles 20.

Standard Miles Master parts were used wherever possible, and hydraulics were eliminated. A non-retracting undercarriage was fitted. The engine was the Rolls-Royce Merlin XX in the standard power egg used on the Beaufighter. Actual performance figures are not available, but the M 20 is claimed to have been slightly faster than the contemporary Hurricane, but slower than the Spitfire, and it carried more ammunition and had a greater range.

Hinged panels on top of the wings gave access to the eight chassis-mounted machine guns. An unusual feature was the placing of fin and rudder forward of the tailplane.

The Batfle of Britain was won, and the M 20 was not put into production.



A "spatted" undercarriage was fitted for ease of production. Note the modern cockpit cover.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

New Bomb

A SPECIAL anti-tank bomb is said to have been used for the first time by *Luftwaffe* fighters and torpedo-bombers in attacks against the invasion fleet.

Regia Aeronautica Losses

ACCORDING to an official statement of the Fascist Italian Government, air force casualties up to end of July, 1943, total 6,000 killed and missing.

Jap Appeal

APPEALING for more aircraft to help win the sea battles now being started in the Pacific, the Japanese paper *Asahi* says: "It is vitally necessary for the home front to pay special attention to the production of more planes, without which no modern naval engagement can be won. First-class machines are needed which, if possible, should be supported by land-based machines. One of the contestants must win the air battle before the real naval engagement between heavy units can begin."

Me 109F's equipped with drop tanks. Awards of 10RM. are paid to finders of these tanks.

Silk

SILK for German parachutes comes mainly from the satellite countries, of which Bulgaria is the chief producer. 100,000 Bulgarian farms are engaged on silkworm breeding and the output for the current year is estimated at 900,000 lb. of silk, a quantity sufficient for the manufacture of about 42 million yards of silk.

In Hungary, Rumania, Croatia and Greece, a system of premiums, subsidies and fixed prices is to sponsor silkworm breeding and in the Serbian part of Yugoslavia the Germans have set up the "Suedostropa" A.G. company, which holds a monopoly for the controlling, purchase and exploitation of the local silk industry.

Luftwaffe's Strength

"SINCE the introduction of the new German long-distance weapon Germany was in the favourable position of being able to employ the *entire Luftwaffe's* strength for tactical purposes over the invasion front, while strategic bombing was carried out by the long-range weapon."

If one considers this statement of an official Nazi spokesman in the light of Allied reports on the spasmodic appearance of the *Luftwaffe* in Normandy, then obviously the strength of the *Luftwaffe* must be at a very low ebb.

Reflections

"WHILE the attack of heavy bombers was the main task of German fighters in the past, the destruction of an enemy fighter or fighter bomber over the invasion area," writes a German war commentator, "is today at least as important because it is just these fighters and fighter bombers which time and again create such difficulties for our grenadiers, tank-crews and gunners. To destroy or at least to divert these fighters and fighter bombers from their targets is the foremost and most urgent task of the German fighters in the west.

"During the long-distance operations against the Reich the Americans had often to employ strong formations of long-range fighters, the number of which was often twice that of the bombers. Nevertheless, the losses of enemy fighters then remained within comparatively narrow limits, because the German fighters specialised in attacking the four-engined bombers, whose destruction was more important than that of the long-range fighters.

"Thus it was that the American fighter formations returned from the air combats over Germany with smaller losses than those suffered by the four-engined bombers. For use over the invasion front, however, the enemy can now dispose not only of the long-range fighter but also of these fighters whose range is more limited than that of a long-range aircraft. Considering that it is considerably easier and quicker to build a fighter than a heavy bomber and that the training of a fighter pilot takes a considerably shorter time than that of bomber crews, whose training still takes almost two years, the question how the enemy can force the employment of fighters on such a scale requires no answer.

German Optimism—

"IT is estimated that London docks and offices have so far lost 23,000,000 working hours. London fire-watchers have been in a state of alert for almost 200 hours and are beginning to show signs of fatigue. Many have not had a hot meal for days."

* * *

"To-day seven million Londoners are forced to resort to camping, and we are told that this is only a beginning."

* * *

Speaking of the robots, a German overseas radio commentator said this: "The new German weapon can change its place of operation and its objective rapidly and without much work. It is independent of weather, time of year, time of day, being in fact an all-round-the-clock, all-weather weapon. Its starting points are out of the range of the enemy's armed forces."

—and Caution

"WE have been educated in five years of war not to indulge in delusions and unfounded hopes. The enemy, surprised by the blow and seized by fear, will mobilise all his technical apparatus to find the answer and, if possible, frustrate the extension of German measures which may be expected, but which cannot be yet anticipated.

* * *

"More weapons, even more effective, will follow. All this is only a beginning. We have justified hopes that in other spheres, too, various German weapons which have proved their worth will soon become effective.

"In the air war our day is not yet over, either. Night attacks have already proved so costly for the enemy that he has very much reduced the frequency of his attacks on the Reich at night.

"Nevertheless, we do not want to entertain any delusions as to the seriousness of the situation. One weapon or a temporary technical superiority in this or the other domain does not bring about a decision."

The Henschel He 123, first German type fitted with drop tanks, is still in service on the Russian front

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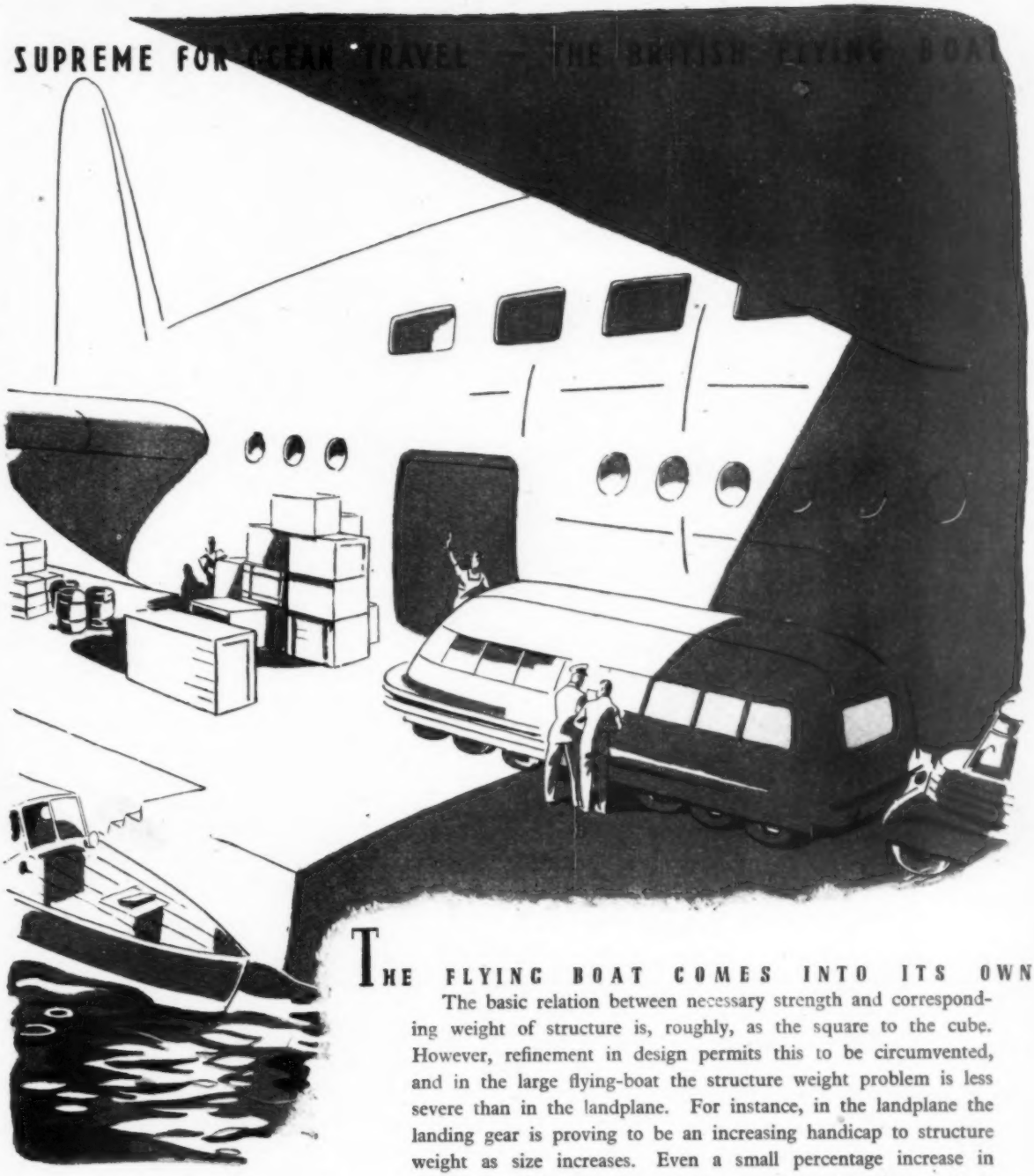

THE FLYING BOAT COMES INTO ITS OWN

The basic relation between necessary strength and corresponding weight of structure is, roughly, as the square to the cube. However, refinement in design permits this to be circumvented, and in the large flying-boat the structure weight problem is less severe than in the landplane. For instance, in the landplane the landing gear is proving to be an increasing handicap to structure weight as size increases. Even a small percentage increase in structure weight may have serious consequences when extreme ranges are concerned, and the payload available, after allowing for fuel, may disappear altogether unless the weight increase with size can be checked. It is safe to rely on the flying-boat to show the greatest payload for long-range flights.

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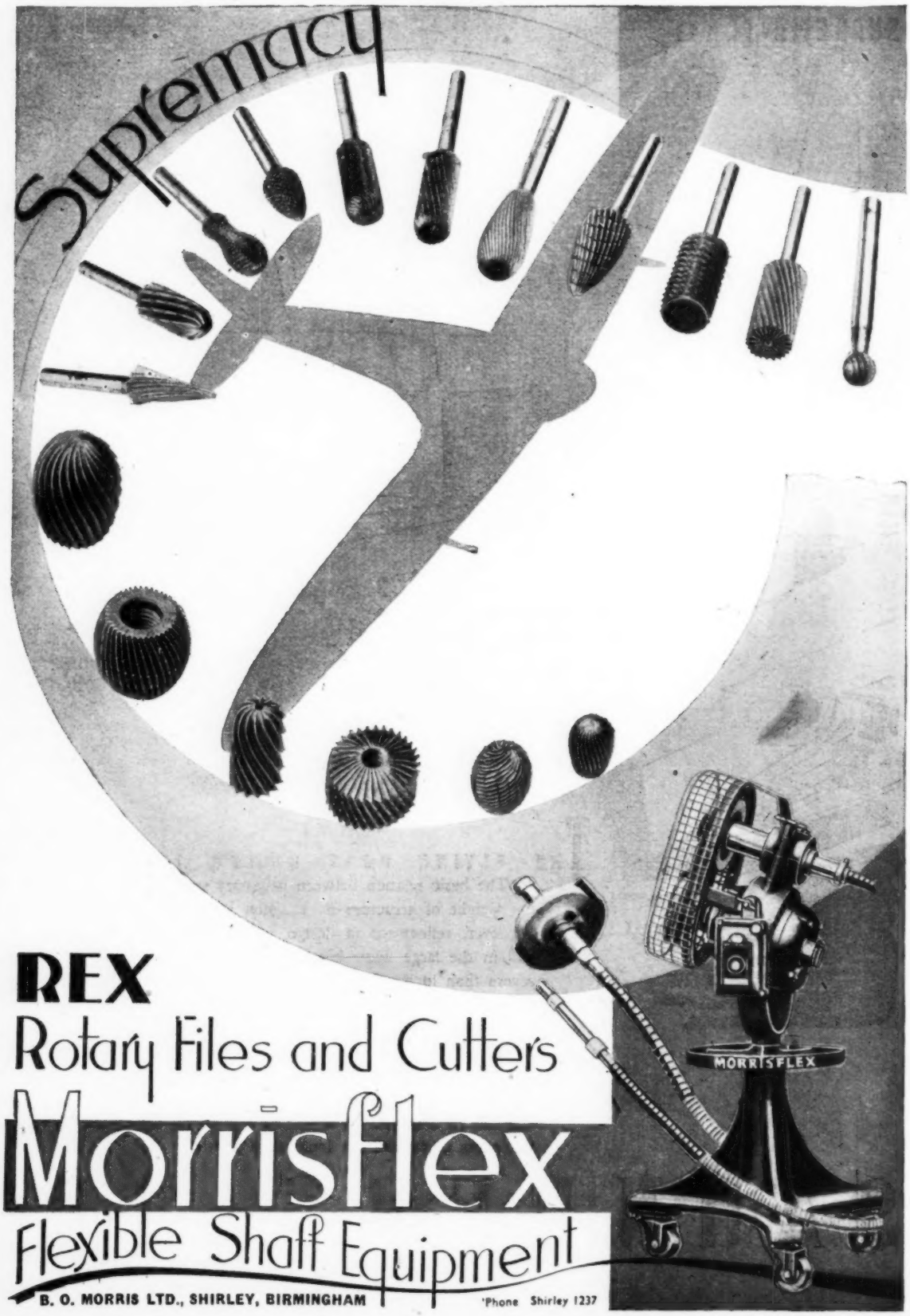

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Fuselage Shells

Technical Comparison of Thick and Thin Skin Monocoque Construction

By F. J. WINGFIELD-DIGBY

UP to recently it may be said that nearly all fuselage design has been of the thin-skin monocque type, consisting of a skin covering of thickness varying from 0.022in. to 0.048in., reinforced by closely-spaced longitudinal stiffeners and transverse bulkheads.

Now that higher speeds are being attained at increasing altitudes in the region where compressibility effects are being felt, there is a tendency to require increased strength due to greater tail loads, more especially on small-size fighter type fuselages; also the importance of surface finish is becoming more pronounced in order to obtain the highest possible speeds.

It therefore seems worth while to consider the use of considerably thicker skinning on the smaller types of aircraft where, owing to the small size of the fuselage, r/t, the ratio of radius of curvature to thickness of the skin, can be made such as to allow a reasonable stress being developed without the necessity of supporting the skin with numerous stiffeners. Thus obtaining a smooth surface finish without irregularities which, without any increase in weight and with simplified construction, leads to a gain in speed due to reduced surface drag.

The use of such material as magnesium, which is about 0.64 times the weight of duralumin and therefore allows the use of a greater thickness, is of advantage in obtaining a favourable ratio of r/t. In order to consider at what value it becomes economical to use a thick-skin construction, it is necessary first to decide what stress is obtained on the normal thin-skin construction.

THE author of this article is chief designer to Westland Aircraft, Ltd. In the Whirlwind magnesium is used as the skin of the rear fuselage portion. Mr. Wingfield-Digby here argues the case for thicker skins with fewer stringers. In other words, a closer approach to true monocoque construction.

Consideration of various thin-skin monocoque fuselages

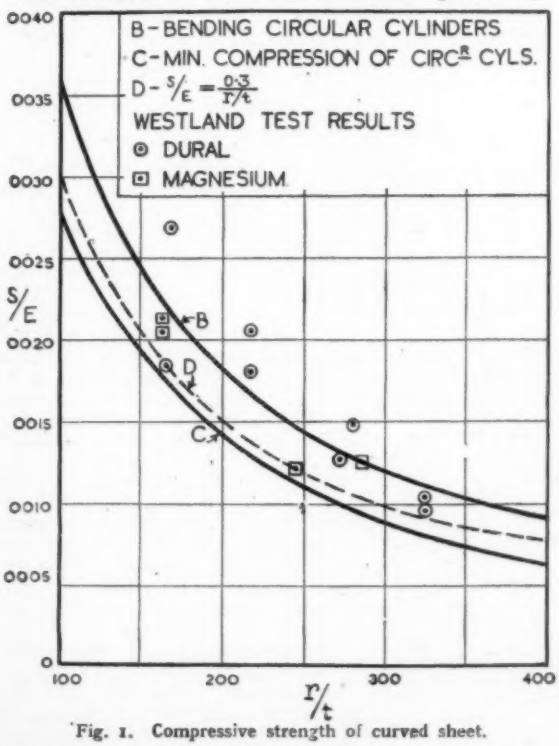


Fig. 1. Compressive strength of curved sheet.

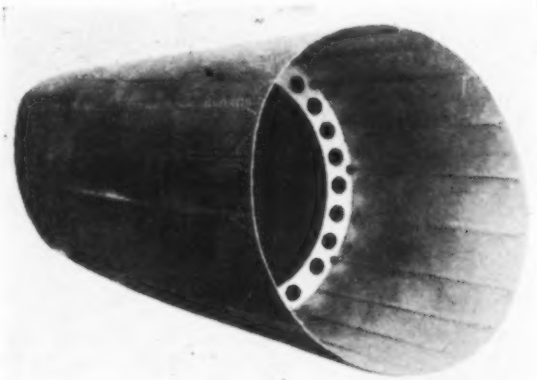


Fig. 2. Whirlwind rear fuselage shell.

shows that the longitudinal stiffeners are usually spaced between 4in. and 8in. apart and the hoop frames between 12in. and 18in. From a study of tests on quadrants and cylinders given in R.A.E. reports, it would appear that a stress of 5½ to 6 tons/sq. in. would be expected from such a fuselage construction (see figures given in Table 1 with 22G skinning); also the writer knows of such values having been obtained on actual fuselage tests, and although higher values may have been obtained by the use of closely spaced closed-section stiffeners, would consider the above stresses as typical when calculated on skin plus longitudinal stiffeners.

If stiffeners are dispensed with, the stress developed is likely to depend largely on the r/t value at the most highly stressed parts of the fuselage. Curves of r/t plotted against

$$\frac{S}{E},$$

where S = stress developed, and E = Young's modulus, are shown in Fig. 1 and are obtained from N.A.C.A. Tech. Note 527, "Strength of thin-walled Duralumin cylinders." The points plotted on these curves are the results of tests carried out at Westland Aircraft, Ltd., when considering the design of the Whirlwind magnesium rear fuselage, a typical example of the thick-skin unstiffened construction, photographs of which are shown. The tests were carried out on 0.048in. and 0.064in. thick duralumin, and on 0.064in. and 0.08in. thick magnesium curved panels.

A stress of 5½ tons/sq. in. for a duralumin fuselage, similar to those given in Table 1, gives a value of

$$S/E = 0.001118,$$

the value of E being 10.5×10^6 for duralumin; therefore it would appear from Fig. 1 that, provided the r/t value is in the order of 250, a similar bending stress can be expected from a pure unstiffened monocoque fuselage in the same material.

TABLE I

Skin thickness	0.029	0.0275	0.029	0.0281	0.0295
Per cent. weight of skin	62.9	65.4	70.1	70.6	74.0
Longitudinal stiffener spacing ...	7.07	4.04	7.07	4.04	7.07
Per cent. weight of longitudinal stiffeners	20.0	23.6	18.8	18.0	14.5
Transverse Stiffeners spacing ..	12in.	12in.	12in.	12in.	12in.
Per cent. weight of transverse stiffeners	17.1	11.0	11.1	11.4	11.5
Stress developed on test	5.7	7.2	5.24	6.06	5.26

FUSELAGE SHELLS

Taking the percentage weight of the skinning as 65 per cent. for the stiffened duralumin fuselage as representative (see Table 1), and as 80 per cent. for the unstiffened fuselage to make allowance for jointing pieces and occasional transverse bulkheads, and using magnesium in place of duralumin, the thickness which will give approximately the same weight will therefore be

$$\frac{80}{65} \qquad \frac{1}{0.64}$$

$=1.92$ times the thickness of the duralumin used in the thin-skin duralumin fuselage. Thus 0.054in. thick magnesium can be used in place of 0.028in. duralumin, or 0.092in. thick magnesium in place of 0.048in. duralumin, and for an r/t value of 250 the radius of curvature required would be 13.5in. and 23.0in. respectively. The stress developed, using a value of E for magnesium of 6×10^6, would be of the order of 3.2 tons/sq. in. using curve D of Fig. 1.

Tests on a completed length of the Whirlwind fuselage, as shown in the photograph, developed a stress of 3.26 tons/sq. in., corresponding to a value of

$$\frac{S}{E} = 0.00122$$

at a value of r/t of between 200 and 220, which will be seen to be slightly below the curves given in Fig. 1, but failure in this case may have been influenced by the end fixing effects.

Local Stiffening

In most cases, in order to get the best result, it may be necessary in practice to add some stiffening near the joint of a fuselage to the centre wing or centre section fuselage, since the bending stresses will be rising rapidly and it might be impractical to vary the skin thickness accordingly. This was done in the case of the Whirlwind by the addition of a top-hat stiffener in the first bay, as can be seen in the photograph.

It will generally be found that the r/t value on the side of the fuselage may be greater than those at the top and bottom, and therefore the stress developed is less, but usually the highest bending stresses arise on the top and bottom due to up and down loads at the tail unit; therefore stiffening on the sides may not be necessary. In the case of larger aircraft it may be most economical to use thick unstiffened skin on the top and bottom of the fuselage, about 0.11in. or 0.12in. thick, and thinner reinforced skin about 0.048in. thick on the sides.

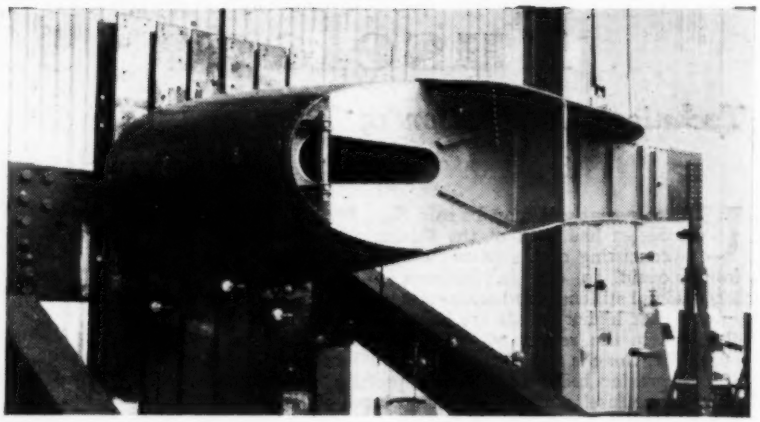


Fig. 4. Whirlwind fuselage on torsion test.

It will be obvious that with the thick-skin monocoque type of construction, greater torsional stiffness will also be obtained than with the thin-skin construction. In the case of the Whirlwind specimen shown in the photograph, no failure occurred on the monocoque fuselage portion of the test specimen, and the torsional shear stress developed was 1.07 tons/sq. in. combined with direct shear stress of 0.36 tons/sq. in., giving a total shear stress of 1.43 tons/sq. in., the test having reached a load 34 per cent. greater than the Air Ministry requirement in force at that time.

In the case of the Whirlwind the r/t values vary from 202 to 120 on the top and bottom, and about 280 constant on the sides, and 0.08in. thick magnesium in strips 13.6in. and 11.8in. wide at the front, tapering to 10.6in. and 6.4in. respectively at the back, were used; these are hand-rolled to the double curvature required and jointed with small Tee duralumin extrusions. These would no doubt be made in magnesium now, either as extrusions or possibly strips of magnesium sheet slightly thicker than the skin. 0.048in. thick transverse bulkheads are placed about 40in. apart.

Corrosion

Some doubt or criticism may arise on the ground of trouble due to corrosion if magnesium sheeting is used, but provided barium chromate paste is used where the magnesium is in contact with duralumin, and the outer paint finish is kept in reasonable condition, no trouble should be experienced. The writer has heard of no such trouble on the Whirlwind rear fuselage which has now been in service for three years operating across the Channel.

It may now be of interest to consider what speed is likely to be gained by resorting to this type of construction on a single-engined, high-speed aircraft. For this purpose we can use a surface area drag coefficient Cf of 0.0045 as being probably obtained in an aircraft constructed throughout with a good smooth surface skinning free from irregularities, as against about 0.065 for most present-day fighters with thin reinforced skins. Assuming that half this gain is due to a further aft transition point on the wings (due to the smooth surface and better wing sections now used) and that the remaining half, 0.01, is due to surface finish improvement spread over the whole aircraft, the surface areas of which are approximately split up as follows: 55 per cent. wing, 13 per cent. tail, 32 per cent. body, then

(*Continued at foot of p.* 20.)

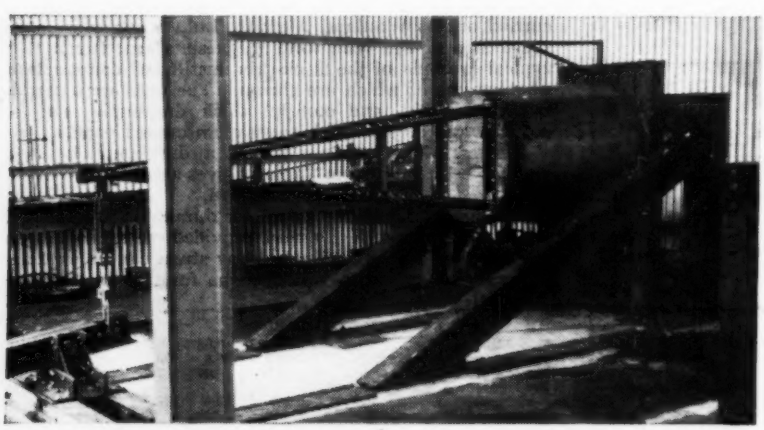


Fig. 3. Whirlwind fuselage on bending test.

A B-29 AMONG THE CLOUDS: The mountain peak is not Fujiyama—yet, but.

Superfortress

Fuller Details of the Boeing B-29 Now Released: Greater Bomb Load Carried Farther, Faster and Higher

SOME months ago (December 30th, 1943) we published such details of the Boeing B-29 Superfortress as were then available. New official releases from America now enable us to amplify the particulars then given. The Superfortress is described as carrying "a greater bomb load and flying faster, farther and higher than any other plane in the world." That was to be expected. On its huge wings, spanning more than 141ft., with its four Wright 18-cylinder Cyclone engines, each developing 2,200 h.p., and with its clean aerodynamic design, it would be a failure if it did not. Details of actual armament and bomb load carried are not disclosed, but the range (presumably with maximum load) is said to be well in excess of the 700 miles' combat range credited to the Fortress. Speed is said to be well in excess of 300 m.p.h., and the practical altitude above 30,000ft.

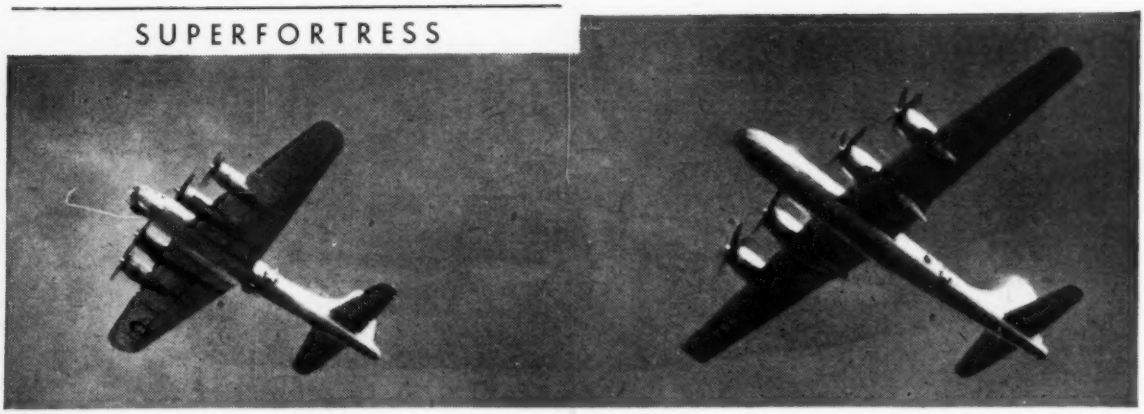
In the main, the armament of the B-29 comprises multiple 0.50 machine guns and 20 mm. cannon. From the absence of visible gun turrets in various places it must be assumed that some of the guns are remotely controlled.

The aerodynamic design of the Superfortress is characterised by wings of high aspect ratio and a very well streamlined fuselage. To have achieved such large-span wings of relatively thin section is no mean achievement and reflects great credit on the Boeing design staff. It is known as the Boeing 117 wing. That it contributes very materially to the high performance cannot be doubted. The tail fin shape which is such a feature of the B-17 has been retained in the B-29.

Of the structural design little is known except that flush riveting is used extensively and all protruberances and openings have been avoided as far as possible. So much

The engines of the B-29 are Wright 18-cyl. radials, driving Hamilton-Standard four-bladed airscrews of 16ft. 6in. diameter.

SUPERFORTRESS



Main differences in size and shape of the Fortress and Superfortress are well brought out by this picture of the two types flying together.

so that the machine looks more like a commercial airliner than the deadly war weapon which it actually is.

An interesting fact about the Superfortress, in view of its size, is that all flying controls are sufficiently light to be operated manually, thus avoiding the weight and complication of servo-motors or "boosters," and enabling the pilot to "feel" his controls better. That all control surfaces are so closely balanced statically and aerodynamically is in a very large measure due to the research work done by the late Edmund T. Allen. Few would ask for a better memorial than that.

As was to be expected, a tricycle undercarriage is used, and as might also have been foreseen, twin wheels are fitted on all three legs. Apart from the difficulties of housing wheels of very large diameter, the use of twin wheels has the further advantage that should one tyre burst, the other would probably remain intact and thus prevent a bad accident. This would apply particularly to the nosewheel.

The four Wright Cyclone engines are housed in nacelles of somewhat unusual design, with a single duct in the lower part for admitting air not only for cooling the engines but for the other services. Thus there is complete absence of smaller scoops all over the machine. The Wright engines drive Hamilton-Standard four-bladed airscrews, said to be the largest airscrew ever to be mass-produced. They have a diameter of 16ft. 6in. A difficult problem arose in connection with providing sufficient high-altitude supercharging for these very powerful engines. The solution was found in the installation of dual sets of turbo-superchargers.

The B-29 is almost literally "all-electric" so far as its various services are concerned. The only exception is found in the wheel-brake system, which is hydraulic.

Into the design of the Superfortress has gone not only all the experience of the Boeing technical staff, but the co-ordinated efforts of the technicians of the Army Air Forces Matériel Command and the combined experience of the Army Air Forces General Staff and Operational Commands. The machine is now being produced in the greatest manufacturing programme ever undertaken. It involves four major companies as prime contractors operating six of the largest aircraft factories in the United States, not to mention hundreds of sub-contractors. The large plants include the Boeing factories in Seattle and Renton, Washington, and Wichita, Kansas; the Glenn L. Martin plant at Omaha, Nebraska; and the new Bell Aircraft Company factory at Marietta, Georgia. In addition, the Fisher Body Division of General Motors Corporation will play a major rôle in the manufacture of sub-assemblies.

The Boeing parent works at Seattle are now changing over from Fortress to B-29 production.

DIGNITY AND IMPUDENCE: A Culver Caydet under the tail of the Superfortress.

Fuselage Shells

(*Continued from page* 18.)

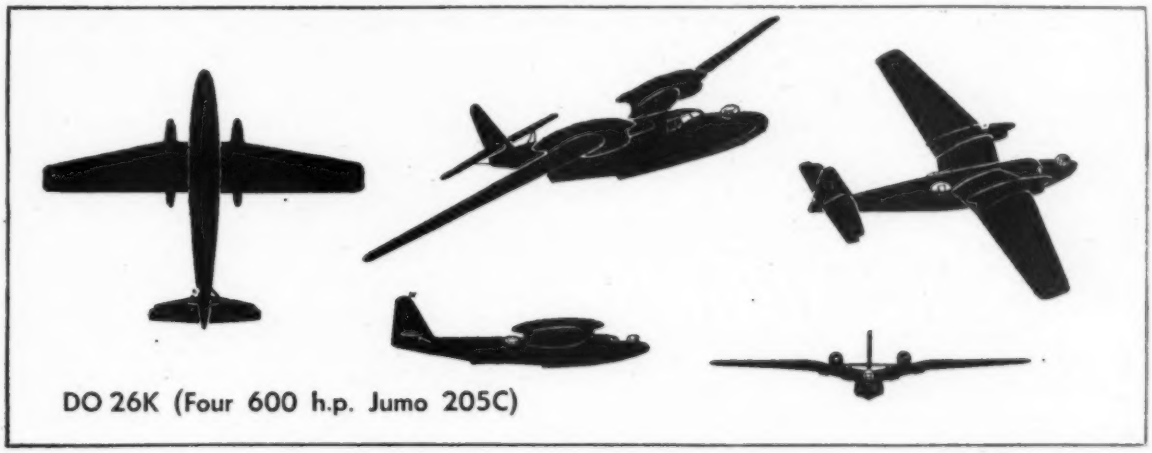
at 400 m.p.h. this gain in Cf from 0.0055 to 0.0045 is equivalent to about 25 m.p.h., of which 32 per cent. or 8 m.p.h. may be due to improved fuselage surface finish.

Thus it may fairly be said that the following advantages can be expected from thick unstiffened monocoque construction in magnesium or duralumin if the r/t values are such as to allow for its use economically.

(1) Gain in speed.
(2) Simplification in construction, and cheaper and easier production.
(3) Possible slight saving in weight where the fuselage is of small dimension and approximating to circular in section.
(4) Greater torsional rigidity.

Studies in Recognition

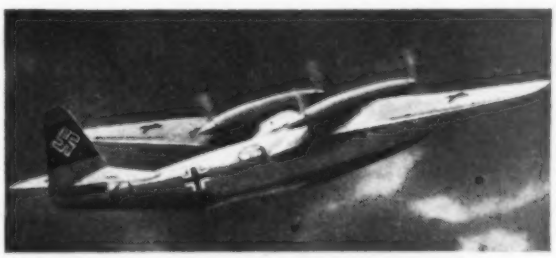
Aircraft in Flying Attitudes



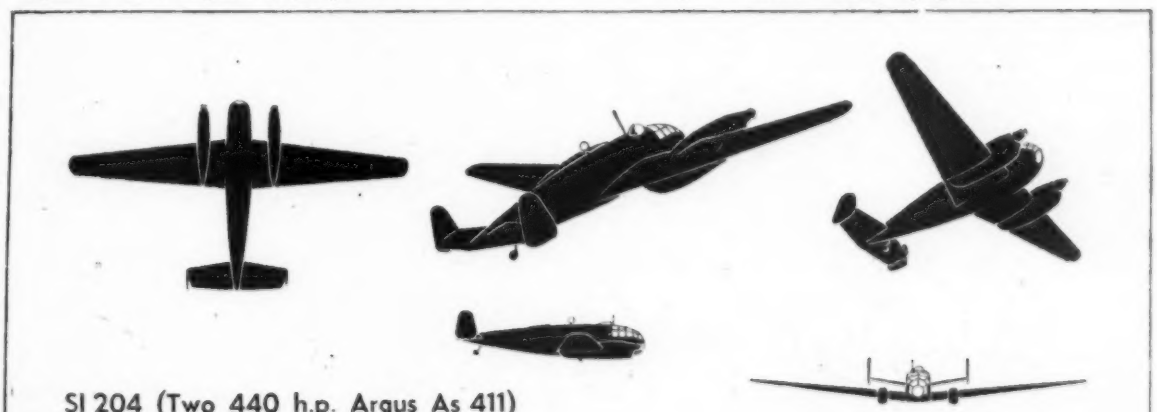
DO 26K (Four 600 h.p. Jumo 205C)

THE Do 26K was the first Dornier flying boat to dispense with sponsons in favour of retractable stabilising floats, and it employs four diesel-type, two-stroke Jumo engines mounted in tandem pairs (two tractor and two pusher) above the centre-section of its gulled wing. These engines are of the opposed piston type, each of six pairs of opposed cylinders having a common combustion space. Two crankshafts—top and bottom—are geared together at the front of the engine. Top speed is 208 m.p.h.

The gulled wing has a backswept leading edge outboard of the nacelles, the trailing edge is straight and the tips square; the strut-braced tailplane also has a backswept leading edge and is mounted on the fin; elevators have projecting horn balances. The shallow hull resembles the Catalina, but has a nose turret. Dimensions: Span 98ft. 6in., length 80ft. 6in., height 22ft. 6in., wing area 1,290 sq. ft.



Dornier Do 26K Flying Boat.



SI 204 (Two 440 h.p. Argus As 411)

Siebel Si 204 Trainer/Transport.

DESIGNED to fulfil the dual functions of advanced trainer and light transport, the Siebel Si 204 is powered by two 440 h.p. Argus As 411 inverted Vee, air-cooled 12-cylinder engines, and has a top speed of 225 m.p.h. The type is also used for reconnaissance, and two versions have been developed which, however, differ only in their operational equipment.

This low-wing cantilever monoplane has high aspect-ratio wings tapering symmetrically to curved tips and with dihedral from the roots. The tailplane is also tapered and carries twin endplate fins and rudders tapering to the apex and with rounded corners. The deep fuselage is of rectangular section and has a blunt, rounded nose, most of which is glazed. Engine nacelles are slim, but project approximately level with the nose and extend back to the trailing edge. There are rectangular cabin windows on each flank. Dimensions: Span 69ft., length 39ft., height 11ft., wing area 495 sq. ft.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

DISCLAIMER

Identity of a Correspondent

IN the Correspondence column of your issue of June 15th reference is made to "Mr. Blackburn."

We should like to point out that this reference is to the W. D. Blackburn who wrote the letter published in your issue of May 18th, and not to Mr. Robert Blackburn or anyone associated with this company.

N. BILES,
Publicity Manager,
Blackburn Aircraft, Ltd.

POWER OUTPUT

Racing Engine Performance

FOR some time now I have been troubled by a question the answer to which must be simple, since none of your more knowledgeable readers have raised it.

It seems generally accepted that the Napier Sabre engine, of 2,220 h.p., is the most powerful of our aircraft engines, but in *Flight* of June 1st there is a photograph of the Rolls-Royce "R" of 2,300 h.p.; it also has the enviable quality of having a specific weight of 0.71 lb./h.p. There is, too, a photograph of the Fiat double engine, which has a horse-power of 2,800! Why are these engines no longer being employed?

The answer would be welcome. Would one of your readers oblige? "MUSHARAPH."

JET PROPULSION FOR AIRCRAFT

Thrust Augmentor Theory

I HAVE followed with great interest the articles and letters published on jet and rocket propulsion.

At last I feel that I have to put in a word on the question of thrust augmentors. Mr. E. Burke, M.Sc., states that the additional thrust from the use of a thrust augmentor is caused by the pressure of the atmosphere. This is probably partly so, but I cannot imagine this additional thrust increasing the thrust of a jet by as much as 40 per cent.

The problem as I see it in its widest aspects is centred round efficiency. The mass of the gases in a jet are increased by means of a thrust augmentor, but the energy remains the same so that, as a consequence, the final velocity of the mass of gas leaving the nozzle is less than it would be without the use of a thrust augmentor.

Now it is a well-known fact that the efficiency of a rocket is at its maximum when the forward velocity of the rocket is in a certain ratio to the velocity of the exhaust gases. Rockets do not usually attain a sufficient speed to obtain this ratio, so that the lower speed of the gases obtainable by means of a thrust augmentor makes this ratio attainable without lowering the kinetic energy of the gases, since their mass has been increased by the additional air obtained through the use of the thrust augmentor.

The increase in efficiency causes an increase in thrust.

A. R. BILLIGHEIMER.

EXHAUST-DRIVEN TURBINES

Could They Operate Flaps, etc.

I READ with great interest the article on exhaust-driven turbo-superchargers which appeared in *Flight* of February 24th, and was impressed with the possibility of using exhaust gases to operate such controls as flaps, undercarriage, airscrew pitch, and gun firing mechanism. Is this practicable?

Perhaps other readers would like to give their opinions. I am particularly interested as this would eliminate hydraulics, and I imagine it would be quite as reliable and much lighter. The possibility of engine failure would, of course, necessitate emergency devices, such as manual operation and gravity, as used on present-day machines.

I doubt whether exhaust gases could operate the above-mentioned controls in addition to the turbo-supercharger, but if my suggestion is practicable, it could, with obvious advantages, be used in advanced trainers, where turbo-supercharging is unnecessary.

F. C. ROBERTS.

THE FUTURE OF CIVIL AVIATION

Solution Lies in Co-operation

MR GRINSTED'S letter in your columns on June 8th is another salutary reminder that there are grave dangers ahead if we allow ourselves to be drawn into an international race for air supremacy. There is no moral justification for such expenditure in a war-stricken world, and it may well lead to bitterness, which will again menace the peace of the world.

The solution to this problem is surely to co-operate in every possible way to establish internationally operated airlines on a regional and world-wide basis. Such an effort can be directed towards unifying the human race and might well become a great safeguard against any nation again using air power to menace the security of the world.

We should consider the creation of an International Civil Aviation Board controlling European and other regional organisations. Money spent on such aeronautical research, development and airline subsidy will be wisely spent and can with every justification be spent liberally to the benefit of all, including the aircraft industry.

GROUP CAPTAIN R. FULLJAMES,
M.C., B.A., A.F.R.Ae.S.

BOOK REVIEWS

"The Model Aeroplane Manual," by Lawrence H. Sparey and Charles A. Rippon. Percival Marshall and Co., 7s. 6d.

THIS is the third edition of a book which has deservedly come to be regarded as the standard work in its field. It has been extensively revised, new information added, and designs for new, up-to-date models incorporated, with detailed instruction for their construction. We do not recall any other book which treats the subject of model aircraft construction so comprehensively and seriously. Moreover, it is phrased with a simplicity that is admirable for its literary style alone. Both the experienced and the newcomer to this fascinating sport will find that this book will show a good dividend in results obtained.

Pointing out in his preface that the pleasure of building and experimenting with flying models is keenest when supplemented by sound technical information, Mr. A. P. Thurston, F.R.Ae.S., says: "Many of our leading aeroplane designers and manufacturers have graduated from the ranks of aeromodellists and still retain a keen interest in the welfare of the sport."

Canada's War in the Air. By Leslie Roberts. Alvah M. Beatty, Montreal.

THIS very weighty and imposing volume tells the really remarkable story of how the aircraft industry in Canada, starting from almost nothing, grew until the Dominion became the greatest producer of aircraft in the world, in proportion to her population.

The book is extensively illustrated, and the photographs, which are mainly of the interiors of factories, are large and well produced, but are so crowded together on the expansive pages of the volume that it is not easy to take them in. One can see the forest, but can hardly distinguish the trees. In short, the appearance of this book is worthy of the great story which it has to tell, but we think that the said story could have been better told in a less ambitious setting.

New Edition.

Gas Turbines and Jet Propulsion for Aircraft

By G. GEOFFREY SMITH, M.B.E.

A THIRD and enlarged edition of this "FLIGHT" book with illustrated descriptions and comments upon the varying forms of steam and gas turbine-compressor units, is now available. Fifteen chapters and many new drawings are included. In this latest edition the original chapters have been retained with modifications and additions. The joint official announcement of the R.A.F. and U.S.A.A.F. has made it possible to extend due credit to the inventive genius and pioneer work of British technicians who developed gas turbine units to a practical stage for aircraft. There is a foreword by Sir Geoffrey de Havilland.

Copies are obtainable through a Bookseller, Price 6/-, or 6/4 by post direct from

Flight Publishing Co. Ltd., Dorset House, Stamford Street, London, S.E.1

WINGS ARE THE WHEELS OF TO-MORROW

GLIDER WITH TANK

INVASION SECRET

Much of the success of the fighting inland of the Normandy landing beaches has been due to the use of Britain's most cherished secret weapon—the Hamilcar glider.

This huge motorless aircraft, which is towed by heavy R.A.F. bombers, was believed by the Germans to be a troop carrier. Tremendous punch has been given to the ground operations by the use of the Hamilcars, which carry a fast light tank or other heavy equipment.

The tank carries a gun and, started up by its crew while it is still airborne, goes into action as soon as the glider touches down.

At the moment of touching down the nose of the glider swings back, and the fuselage sinks to the ground to allow the tank to run out free.

The Hamilcar wing span is greater than that of a Lancaster. It has such manœuvrability that it can be landed in a medium-sized meadow with almost mathematical certainty by night or day from a release point several miles distant.

THE HAMILCAR

BRITAIN'S LATEST SECRET WEAPON

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FELTHAM MIDDLESEX

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At 60° F. too large. At −60° C. a "freedom fit." This is what one series of "Prestcold" low-temperature cabinets can achieve.

Take for example a case where a duralumin bush has to be fitted into a magnesium casting :—

Diam. of bush at shop temperature (say)	1.9400 ins.
Diam. of bore of casting	1.9380 ins.
Interference	0.0020 ins.

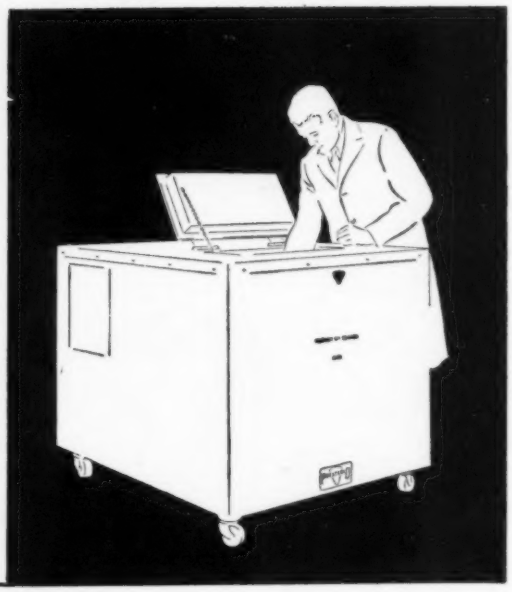
Take now the new readings after the temperature of the bush has been reduced in a specially designed refrigerator to −60° C.

Diam. of bore of casting at shop temperature	1.9380 ins.
Diam. of bush at −60° C.	1.9369 ins.
Clearance	0.0011 ins.

This means a freedom fit which speeds up production, reduces scrap, eliminates swarf and so on.

Cabinet illustrated is a general-purpose "shrink fit" refrigerator with cooling compartment 21" × 10" × 16". Other sizes available and special-purpose equipment.

An investigation into the possibilities of Prestcold refrigeration equipment in your factory would cost you nothing. Consultations given in any part of the country.



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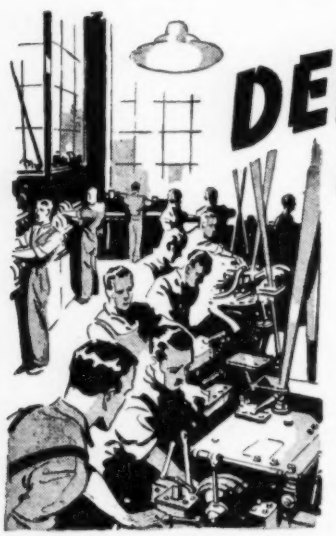

DERMATITIS *is the "operative" danger*

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No. 1 for protection against paint, grease, oil, etc.

No. 2 for protection against soluble oil, spirits and chemical solutions.

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ANOTHER NORMAN CONQUEROR: A Spitfire IX in the hands of the R.A.F. Repair and Salvage Unit after making a crash landing in Normandy.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Promotions

TECHNICAL BRANCH.

Air Commodores are granted the rank of Act. Air Vice-Marshal.

O. E. CARTER, C.B.E., A.F.C., May 18th, 1944.
A. C. STEVENS, C.B., June 8th, 1944.

Awards

Fleet Air Arm

THE KING has been graciously pleased to approve the following awards:—

For outstanding skill and devotion to duty when testing an aircraft.

M.B.E. (Mil.)

Temp. Lt. (A) G. P. de la T. SHEA SIMONDS, R.N.V.R.

While in mid-air the engine broke clean away from its frame, upsetting the trim of the aircraft, but Lt. Shea-Simonds regained control and contrived to land in such a way that it was possible to ascertain the cause of the accident.

For skill and determination in attacks on U-boats while operating from H.M. Ships Fencer and Vindex:—

Distinguished Service Cross

Temp. Sub. Lt. (A) W. H. THOMSON, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Flt. Lt. G. D. GRAHAM, M.B.E., R.A.F.V.R., No. 357 Sqn.

Act. Wing Cdr. H. W. ELIOT, D.F.C., No. 255 Sqn.—Wing Cdr. Eliot was promoted to command the squadron in August, 1943, at a time when heavy demands were being made for the night defence of Bizerta, Tunis and Palermo. Since then, largely due to his drive and encouragement, the squadron has destroyed 23 enemy aircraft, two of which have been destroyed by Wing Cdr. Eliot personally. This officer has flown regularly on night patrols displaying a remarkable disregard for the weather. He is an intrepid night fighter pilot, who has earned the respect of all who have served under him.

Bar to Distinguished Flying Cross

Flt. Lt. J. A. KING, D.F.C., R.A.F., No. 357 Sqn.

Flt. Lt. A. E. Umbers who has shot down the most flying bombs in his squadron. He flies a Tempest, and was for a while a Hawker-Siddeley test pilot.

Distinguished Flying Cross

F/O. W. W. W. TURNBULL, R.C.A.F., No. 9 Sqn.
P/O. S. C. HODGES, R.C.A.F., No. 626 Sqn.
W/O. A. McA. BARROWMAN, R.C.A.F., No. 97 Sqn.
W/O. G. CATTINY, R.C.A.F., No. 625 Sqn.
W/O. F. C. DAVIES, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
W/O. C. L. DOUGLAS, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
W/O. A. R. G. FONSECA, R.C.A.F., No. 7 Sqn.
W/O. T. J. HOWARD, R.C.A.F., No. 405 (R.C.A.F.) Sqn.
W/O. O. D. MCLEAN, R.C.A.F., No. 429 (R.C.A.F.) Sqn.
W/O. J. A. MCN. SEATON, R.C.A.F., No. 166 Sqn.
W/O. E. C. THOMPSON, R.C.A.F., No. 207 Sqn.
F/O. D. H. TUDHOPE, R.N.Z.A.F., No. 139 Sqn.
F/O. A. G. BELL, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
F/O. A. BOWERS, R.C.A.F., No. 138 Sqn.
F/O. J. R. HARDING, R.C.A.F., No. 550 Sqn.
F/O. H. L. REES, R.C.A.F., No. 576 Sqn.
F/O. R. J. U. G. ROCHELEAU, R.C.A.F., No. 131 Sqn.
F/O. W. W. TUCKER, R.C.A.F., No. 423 (R.C.A.F.) Sqn.
F/O. G. M. WALLS, R.C.A.F., No. 435 (R.C.A.F.) Sqn.
F/O. G. A. WELDON, R.C.A.F., No. 427 (R.C.A.F.) Sqn.
P/O. V. J. BOUCHARD, R.C.A.F., No. 550 Sqn.
P/O. J. F. EDWARDS, R.C.A.F., No. 115 Sqn.
P/O. E. J. HURD, R.C.A.F., No. 408 (R.C.A.F.) Sqn.
P/O. W. N. MCINNIS, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
P/O. G. C. STEPHEN, R.C.A.F., No. 51 Sqn.
P/O. J. A. G. TREMBLAY, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
P/O. E. H. WOOD, R.C.A.F., No. 408 (R.C.A.F.) Sqn.

Conspicuous Gallantry Medal (Flying)

Act. Flt. Sgt. T. E. WHITE, R.A.F.V.R., attached No. 357 Sqn.

Distinguished Flying Medal

Flt. Sgt. G. ALLAN, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. J. D. ATKINSON, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. R. BATSON, R.A.F.V.R., No. 617 Sqn.

SERVICE AVIATION

Flt. Sgt. E. H. BENTLEY, R.A.F.V.R., No. 102 Sqn.
Flt. Sgt. L. BRETTELL, R.A.F.V.R., No. 626 Sqn.
Flt. Sgt. R. A. CHRISTIE, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. W. DAVIS, R.A.F.V.R., No. 57 Sqn.
Flt. Sgt. E. G. GROVER, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. H. JOHNSON, R.A.F.V.R., No. 57 Sqn.
Flt. Sgt. V. F. C. LAKER, R.A.F.V.R., No. 44 Sqn.
Flt. Sgt. A. G. LESLIE, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. D. G. LUCKING, R.A.F.V.R., No. 90 Sqn.
Flt. Sgt. C. F. MACE, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. A. G. MEARNS, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. A. L. NORMAN, R.A.F.V.R., No. 166 Sqn.
Flt. Sgt. J. H. ORMESHER, R.A.F.V.R., No. 431 (R.C.A.F.) Sqn.
Flt. Sgt. N. W. PARKER, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. S. POOLE, R.A.F.V.R., No. 429 (R.C.A.F.) Sqn.
Flt. Sgt. A. G. STRETCH, R.A.F., No. 83 Sqn.
Flt. Sgt. R. A. McL. WARDLE, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. C. W. WICKS, R.A.F.V.R., No. 76 Sqn.
Sgt. A. G. BOUD, R.A.F.V.R., No. 625 Sqn.
Sgt. P. R. CHAMBERS, R.A.F.V.R., No. 166 Sqn.
Sgt. D. B. GERRARD, R.A.F.V.R., No. 10 Sqn.
Sgt. D. F. HAYWARD, R.A.F.V.R., No. 103 Sqn.
Sgt. W. F. KINGTON, R.A.F.V.R., No. 90 Sqn.
Sgt. E. MAYFIELD, R.A.F.V.R., No. 100 Sqn.
Sgt. R. B. SILVERWOOD, R.A.F.V.R., No. 138 Sqn.
Flt. Sgt. D. R. CANTERA, R.C.A.F., No. 90 Sqn.
Flt. Sgt. C. H. L. WRIGHT, R.A.F.V.R., No. 7 Sqn.
Act. Flt. Sgt. B. S. CUBBAGE, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. A. W. BAINES, R.A.F.V.R.
Flt. Sgt. J. L. ELLIOTT, R.A.F.V.R., No. 9 Sqn.
Sgt. G. H. CASTELL, R.A.F.V.R., No. 207 Sqn.

THE KING has been graciously pleased to approve the following award in recognition of gallant and distinguished services in Italy:—

Distinguished Flying Cross

Lt. (temp. Capt.) W. G. GORDON, Royal Regiment of Artillery.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy in the South-West Pacific area:—

Distinguished Flying Cross

Sqn. Ldr. J. R. KINNIMONT, R.A.A.F.
Flt. Lt. A. C. YOUNG, R.A.A.F.
F/O. N. P. C. GUNSON, R.A.A.F.

Foreign Decorations

THE KING has granted unrestricted permission for the wearing of the undermentioned decorations conferred upon the personnel indicated in recognition of valuable services rendered in connection with the war:—

Conferred by the President of the Czechoslovak Republic

Medal for Valour

P/O. G. W. SHAW, R.A.F.V.R.

Conferred by the President of the United States of America

Legion of Merit (Officer)

Wing Cdr. T. B de la P. BERESFORD, D.S.O., D.F.C., R.A.F.

Distinguished Flying Cross

Air Comdre. A. GRAY, C.B., M.C., R.A.F.
Maj. E. C. SAVILLE, D.F.C., S.A.A.F. (since deceased).
F/O. D. P. MCINTYRE, D.F.C., R.C.A.F.
F/O. J. M. CHURCHILL, R.C.A.F.
F/O. A. J. MACKIE, R.C.A.F.
F/O. A. A. MARTIN, R.C.A.F.
P/O. A. L. CARR, R.C.A.F.

Air Medal and 6 Oak Leaf Clusters

F/O. A. A. MARTIN, R.C.A.F.

Air Medal and 4 Oak Leaf Clusters

F/O. W. J. MIRON, R.C.A.F.
P/O. C. S. FLECK, R.C.A.F.

Air Medal and 3 Oak Leaf Clusters

P/O. R. D. GALL, R.C.A.F.
P/O. A. P. LAMOUREUX, R.C.A.F.
P/O. R. D. ROBERTSON, R.C.A.F.

Air Medal and 2 Oak Leaf Clusters

P/O. A. L. CARR, R.C.A.F.
P/O. D. H. CRUICKSHANK, R.C.A.F.
P/O. G. W. MARTINO, R.C.A.F.
P/O. F. ROBERTSON, R.C.A.F. (since deceased).

Air Medal and 1 Oak Leaf Cluster

P/O. J. P. PARADIS, R.C.A.F.
P/O. R. E. SIBBALD, R.C.A.F.

Soldiers Medal

Cpl. D. M. HARRETT, R.C.A.F.

Roll of Honour

Casualty Communiqué No. 392.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 102 are second entries giving later information of casualties published in earlier lists.

Air Vice-Marshal H. Broadhurst, A.O.C. of an R.A.F. fighter group in France, in the cockpit of his Spitfire. Until recently he commanded the famous Desert Air Force.

Royal Air Force

KILLED IN ACTION.—P/O. J. Brooks; Sgt. R. A. Capel; Flt. Sgt. D. A. Churchill; Sgt. T. S. Connell; P/O. C. A. Donovan; Flt. Sgt. S. Glass; Sgt. J. J. Hutton; Sgt. P. F. Kelly; Flt. Sgt. D. P. McCormack; Act. Sqn. Ldr. M. McCreanor; Sgt. A. W. McLennan; Sgt. R. J. Maton; F/O. P. E. Mitchell, D.F.C.; Flt. Lt. P. Plumridge; Flt. Lt. J. C. S. Ponsford; Sgt. J. Shepherd; Flt. Sgt. T. W. Thompson; Flt. Sgt. G. W. West; Flt. Sgt. J. Wilkinson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. A. M. Barnard; P/O. P. H. Conroy; Sgt. J. Curson; Sgt. D. F. A. Hobbs; Sgt. G. L. Perry.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Sqn. Ldr. C. F. Andrew, D.F.C.; Sgt. D. W. Archer; Sgt. J. W. Bailey; Sgt. D. Barker; Flt. Sgt. A. A. C. Bedward; Flt. Sgt. C. D. Brown; P/O. A. H. Coates; Sgt. D. E. Croft; Sgt. J. Cumming; Sgt. R. C. Davies; F/O. P. De Villiers; Flt. Sgt. J. D. Dodds; Flt. Sgt. C. T. W. Downing; Flt. Sgt. J. A. Dunbar; Sgt. P. C. Evans; Sgt. D. C. Fentiman; Sgt. S. E. Finch; Flt. Sgt. A. Fletcher; P/O. S. F. N. Fox; Sgt. A. N. Gibbons; Sgt. J. W. Gillard; F/O. G. N. Hammond; P/O. W. H. Hodson; F/O. G. J. Homersham; Sgt. G. Hopkins; Sgt. C. D. Hughes; Flt. Sgt. R. W. Jaques; Sgt. W. H. Jordan; Flt. Sgt. F. E. Juggins; Sgt. S. R. Kenny; P/O. B. G. Knoesen; Sgt. M. A. Lodge; Sgt. S. C. McKiernan; F/O. L. W. Machin; F/O. N. Manifold; P/O. D. J. Marks; Flt. Sgt. L. C. Matthews; F/O. E. Mawson; Sgt. W. O'Brien; P/O. J. M. Phillips; Sgt. H. Pickup; P/O. R. V. Procter; Sgt. T. N. Robinson; P/O. A. A. Rossie; Sgt. S. E. Russell; Sgt. C. F. Sargent; Flt. Lt. G. A. Sawtell; Sgt. G. R. Slack; Sgt. A. Smith; P/O. E. Solomon; Sgt. J. D. Stewart; Sgt. W. E. Stobbs; Sgt. P. D. Straton; Sgt. P. H. Unwin; Flt. Sgt. T. R. Urquhart; Sgt. C. Watkin; Flt. Sgt. A. C. Wilder; P/O. D. Williams.

WOUNDED OR INJURED IN ACTION.—Sgt. J. W. Porteous.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—F/O. T. A. Evans; Sgt. D. A. Hooker; Flt. Sgt. C. Kirby.

MISSING, BELIEVED KILLED IN ACTION.—P/O. R. Downing; Sgt. J. Mowbray; Sgt. E. F. Pates; Sgt. O. S. Roberts; W/O. P. J. Thomas; Sgt. W. Walmsley; Act. Sqn. Ldr. W. M. Whitamore, D.F.C.

MISSING.—F/O. F. Aiston; Sgt. B. E. Ansell; Sgt. R. Armstrong; Sgt. B. V. Arney; Sgt. T. W. Bailey; P/O. J. Batten-Smith; Sgt. D. S. Beckwith; P/O. H. E. Beer; F/O. R. B. Bestwick; Sgt. W. H. Broadmore; Sgt. J. G. Bruen; Sgt. W. Chapman; Sgt. W. Clark; P/O. W. D. Coates, D.F.M.; W/O. R. H. Cook; F/O. A. V. Cormack; Sgt. D. O. Cottrell; Sgt. W. Dawson; Flt. Lt. R. F. Dura; F/O. A. Evans; Sgt. C. J. Evans; Flt. Sgt. R. D. Falconer; Sgt. D. M. Ford; Sgt. L. Gammage; Sgt. A. Garcia; F/O. G. F. Garland; Sgt. W. W. Gould; Sgt. A. W. Gowland; Sgt. W. Harris; Flt. Sgt. P. J. Hatton; Flt. Sgt. A. Haynes; F/O. F. Henderson; Sgt. J. W. Holland; F/O. T. R. Holland; Sgt. D. E. Hunt; Sgt. G. K. Jones; Flt. Sgt. R. H. Knight; Sgt. J. J. Lambert; Sgt. J. C. A. D. Lavender; F/O. E. S. Lindsell; Flt. Sgt. F. Lovatt; Flt. Sgt. G. M. Lucas; Sgt. J. C. McCartney; Sgt. H. F. McClenaghan; Sgt. J. J. McInroy; Sgt. K. V. Miller; Sgt. E. A. Milliner; Flt. Sgt. A. P. Myles; Sgt. B. H. Nicholas; Flt. Sgt. S. Nuttall; Sgt. P. L. O'Brien; Sgt. E. Osborne; Sgt. R. H. Owen; Flt. Sgt. V. L. Perry; Sgt. H. Pole; Sgt. S. R. J. Price; P/O. W. G. Ramwell; Sgt. J. B. Remington; Flt. Sgt. R. G. Rivers; Sgt. E. W. Roberts; Sgt. R. R. Roberts; Flt. Sgt. A. H. Ross; W/O. R. R. Sanderson; Sgt. G. Scholefield; Sgt. F. E. Simons; Sgt. P. R. Simpkin; W/O. J. Skeel; Sgt. W. J. R. Smith; Sgt. O. W. Sporne; Flt. Sgt. W. F. Stockwell; Flt. Sgt. S. Swift; Sgt. C. N. Tasker; Sgt. R. D. Taylor; Act. Flt. Sgt. A. G. Terrell; Sgt. N. A. Thomas; Sgt. F. Thompson; Sgt. A. Thorpe; Sgt. R. Tugman; Flt. Lt. H. A. Turner; F/O. I. A. Turnbull; P/O. C. A. Weeks; Sgt. H. Whitby; Sgt. R. C. Wild; P/O. G. H. Williams; Flt. Sgt. L. E. Willis; Sgt. R. F. Willis-Culpitt; Flt. Sgt. L. V. Woodfield; Sgt. R. W. C. Yeaman; Sgt. W. L. York.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Act. Wing Cdr. H. G. F. Gaubert, D.F.C.; L.A/C. F. H. Reed; Flt. Sgt. H. O. Westmorland; Act. Sqn. Ldr. W. G. Williams.

KILLED ON ACTIVE SERVICE.—A/C.2 G. S. Adams; Flt. Sgt. J. C. S. Arnold; Sgt. G. W. Ball; F/O. A. Calvert; Act. Wing Cdr. E. F. K. Campling, D.S.O., D.F.C.; Sgt. C. P. Cantlin; Flt. Sgt. D. C. Capewell; P/O. J. G. D. Clark; Sgt. S. Claypole; Flt. Sgt. W. M. Dalziel; L.A/C. G. A. Doughty; Flt. Sgt. F. A. Duggan; Sqn. Ldr. H. N. Fowler; L.A/C. R. P. Freer; A/C.2 R. P. J. Gearing; Sgt. A. Harnell; Act. Wing Cdr. M. M. Hutchinson, A.F.C.; Sgt. P. Johnstone; A/C.2 G. V. F. Killick; A/C.1 T. King; P/O. W. L. H. B. Landies; F/O. G. W. Leadsom; Sgt. T. Longstaff; Sgt. D. McInnes; W/O. T. D. Mayow; Sgt. S. Meera; F/O. F. W. Newton; Sgt. D. A. Parke; Sgt. G. L. Pettitt; A/C.1 H. Quinton; Sgt. L. T. D. Regan; Sgt. T. A. Regan; W/O. W. Richardson; Flt. Sgt. G. W. Roberts; Flt. Sgt. D. S. Sabine; L.A/C. R. W. Spencer; A/C.1 A. H. Spiller; Sgt. A. J. Spinks; A/C.1 E. R. Steventon; F/O. J. R. Teece; Flt. Sgt. N. Thompson; Sgt. H. T. Tulett; Sgt. D. D. Twomey; Flt. Sgt. J. T. Wilkinson; Sgt. T. J. Williams; Flt. Sgt. G. D. Wyatt; Flt. Sgt. N. S. Youster.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. A. W. Adams; Cpl. R. Ainsworth; A/C.1 A. Booth; L.A/C. J. E. Crone; L.A/C. J. P. Goates; Sgt. D. O. Hedges; F/O. R. Lund; Sgt. F. Plows; A/C.1 N. R. Taylor; F/O. S. G. Wallis; Sgt. P. Walmsley; L.A/C. T. R. Wicks.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. G. J. Fundell; L.A/C. L. W. George; Flt. Sgt. J. C. T. Jackson; Sgt. H. McKernan.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. G. A. D. Brunt; A/C.2 J. M. Gonsalves.

DIED ON ACTIVE SERVICE.—A/C.2 A. V. Collings; L.A/C. F. H. Cox; L.A/C. T. Davies; Sgt. R. D. George; L.A/C. G. C. E. Grace; Cpl. J. Hanson; A/C.1 E. Howarth; Flt. Sgt. R. Kelly; L.A/C. S. Mercer; L.A/C. W. H. Pitt; A/C.2 J. R. Stewart; Cpl. C. E. Winter.

Women's Auxiliary Air Force

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Act. Flt. Officer J. M. Bushby; Act. Flt. Officer V. B. Qu'A. Shelly.

KILLED ON ACTIVE SERVICE.—S/O. E. V. Weatherhead.

DIED ON ACTIVE SERVICE.—A/CW.2 J. N. Botting.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. N. M. Davis; W/O. R. E. Mudie.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. C. B. Anderson, D.F.C.; Flt. Sgt. A. G. Ashley; F/O. A. K. Biggs; Flt. Sgt. R. T. Bilsby; F/O. N. Cole; P/O. C. Edwards; F/O. D. W. Ellis; Flt. Sgt. W. Harper; W/O. P. L. Jones; Flt. Lt. W. R. Kilpatrick; Flt. Sgt. A. Morley; F/O. C. T. O'Riordan; Sgt. R. Quine; P/O. B. S. Reilly; F/O. P. S. A. St. Ledger; Act. Flt. Lt. I. M. Wood.

MISSING.—F/O. P. C. T. Armytage; F/O. R. J. Browning; F/O. B. D. Burnell; W/O. A. Hamilton; Flt. Sgt. T. W. Hennessy; W/O. M. A. Hines; F/O. H. E. Jarvis; Flt. Sgt. W. J. Leahy; Flt. Sgt. B. G. Stokes; Flt. Sgt. M. D. H. Williams.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. E. K. Ferguson; W/O. J. H. Lees; Flt. Sgt. K. Payne; Flt. Lt. H. R. Rowlands.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Flt. Sgt. R. M. Morton.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. W. A. Horsley.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. B. A. Ogilvie; Flt. Lt. R. B. Palmer; Flt. Lt. L. Patterson; Flt. Sgt. A. B. Pattison.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. W. B. Reynolds; W/O. R. D. Tod; Flt. Sgt. R. E. Tod, D.F.M.

WOUNDED OR INJURED IN ACTION.—Sgt. W. H. Keen; Sgt. C. McRae; F/O. W. P. Prosser.

MISSING, BELIEVED KILLED IN ACTION.—F/O. T. W. Cooper; Sgt. D. W. Howell; F/O. J. L. McGill; W/O. W. F. Russell; F/O. T. L. W. Teasdale; F/O. E. J. Underhill.

MISSING.—F/O. J. M. Baldwin; Sgt. M. E. Barnard; P/O. C. A. Cawson; Flt. Sg. G. A. Dancey; Flt. Sgt. L. G. Davey; W/O. F. E. Johnson; Flt. Sgt. H. W. Lossing; W/O. F. B. Magee; Sgt. J. Munro; Sgt. H. W. Nixon; W/O. J. D. Owen; Flt. Sgt. C. L. Panton; W/O. M. H. Penhale; P/O. R. H. L. Potentier; F/O. D. A. Robinson; W/O. H. Thornton; Sgt. C. H. Winters.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. H. Broad; P/O. K. O. Mitchell; Sgt. J. L. Peck.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. W. J. Beuglet; P/O. E. Ferguson; W/O. B. W. Wood.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. D. J. Cameron.

DIED ON ACTIVE SERVICE.—F/O. B. S. Sussman.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. M. Metcalfe; Flt. Sgt. N. B. Whitta.

MISSING.—P/O. A. S. Frampton; Flt. Sgt. A. J. P. Souter.

KILLED ON ACTIVE SERVICE.—Flt. Lt. I. W. Speirs.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. T. R. D. Kebbell.

South African Air Force

MISSING.—2 Lt. A. Thompson.

DIED ON ACTIVE SERVICE.—P/O. G. Miller.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Lt. D. J. Cowie; Lt. N. M. MacDonald; Lt. E. K. West.

Casualty Communiqué No. 399.

Of the names in this list 96 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. G. A. Alexander; F/O. S. A. Appleton; Sgt. J. S. Bovee; Sgt. W. Cotton; Sgt. D. R. Evans; Sgt. S. F. Gent; Sgt. K. Green; P/O. G. Hutt; Flt. Lt. F. J. Perry; Sgt. H. W. Roberts.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. W. Biggs, D.F.M.; P/O. L. E. Moyler, D.F.M.; Sgt. M. A. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. L. W. Aspden; Flt. Sgt. W. H. Austin; Sgt. D. A. Barnfather; Flt. Sgt. H. A. Bate; Sgt. F. A. Berry; Sgt. K. J. Bevis; Sgt. H. Bradley; Flt. Sgt. G. A. Briggs; Sgt. W. Brown; Act. Sqn. Ldr. P. Burndark, D.F.C., D.F.M.; Sgt. R. E. Burrows; Sgt. W. H. Cade; Sgt. E. J. Cahill; Sgt. A. Castle; Flt. Sgt. J. B. Charters; Sgt. N. A. P. Chew; Sgt. E. W. Clayton; Sgt. R. A. Cole; Sgt. E. S. Crabbe; Sgt. J. Crammond; Sgt. F. A. Crawford; Sgt. J. Crowther; F/O. J. W. I. Day; P/O. K. T. Dixon; Sgt. R. W. Dobbins; Sgt. J. Dolan; Sgt. S. E. R. Douglas; P/O. W. F. Drew; Sgt. W. F. Eades; P/O. E. G. Farr; Sgt. A. Garner; Flt. Sgt. T. H. Greaves; Sgt. W. Green, Sgt. H. V. Hawkins; F/O. W. J. J. Hitchcock; P/O. H. Holman; Sgt. R. E. Horswill; Sgt. L. F. Jeffries; Sgt. F. Keep; Sgt. J. Kemm; F/O. G. King; Flt. Sgt. M. R. W. King; Sgt. J. Land; Flt. Sgt. A. E. Lefort; Sgt. A. Lucas; Sgt. G. A. McArthur; Sgt. D. McDonald; P/O. E. F. C. Matthews; Sgt. J. W. Merrie; P/O. J. S. Moore; Flt. Lt. G. L. Mott; Sgt. P. J. Norreys; Sgt. H. S. Norrington; Sgt. P. C. O'Kill; P/O. P. W. Phillips; P/O. J. Read; Sgt. K. Robson; Sgt. J. W. Rooke; Sgt. H. R. Smith; P/O. W. E. Smith; Sgt. H. R. Snell; Sgt. K. F. W. Stevens; Sgt. R. Sumner; Sgt. F. J. Swift; Sgt. M. C. Thompson; Sgt. K. R. Wallace; Sgt. P. W. Wallis; Sgt. L. P. Ward; Sgt. H. W. J. Ware; Sgt. W. Warrington; Sgt. C. F. Webb; P/O. F. Whitlock.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. R. Frith.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. J. H. R. Harris.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. P. J. Regan.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. A. Beaumont; Sgt. E. Birch; Sgt. R. S. Bourne; Sgt. W. F. Burkitt; Sgt. J. Clark; Flt. Sgt. A. Finch; F/O. J. W. Hearn; F/O. A. E. Manning; Flt. Sgt. D. R. Neal; Sgt. L. Pearson; Group Capt. N. C. Pleasance; Sgt. C. Sedden; Sgt. J. M. Smith; Sgt. L. A. Taylor; Sgt. H. V. J. Thorne; P/O. R. C. Thornton; Flt. Sgt. J. B. Underwood; Sgt. J. Webb; F/O. D. R. Wimlett; Sgt. J. J. Zammit.

MISSING.—P/O. C. L. E. Allen; Sgt. R. C. Atkinson; Sgt. C. Banks; Flt. Sgt. W. E. Blake; Sgt. F. Bolian; Flt. Sgt. K. A. Bray; Sgt. W. Broderick; F/O. A. D. Bull; Sgt. G. Burrows; Sgt. J. Campbell; Flt. Sgt. J. N. Carter; Sgt. R. Catlow; Sgt. E. J. Cave; Sgt. F. T. Coulter; Flt. Sgt. A. Craven; Sgt. R. M. Cringle; Flt. Sgt. G. S. Davies; Flt. Sgt. T. Dawson; Sgt. R. J. Day; Sgt. L. W. Denning; Flt. Sgt. T. Duff; Sgt. D. Dushman; Sgt. D. Evans; Flt. Sgt. A. J. Elliott; Sgt. C. Fearman; Sgt. S. L. Fereday; Sgt. P. O. Fenner; Sgt. F. E. Fountaine; Flt. Sgt. A. Frith; Sgt. J. G. Fulton; P/O. J. Garside; Sgt. J. Gate; Flt. Sgt. E. G. Grundy; Sgt. D. Gilmore; Flt. Sgt. H. D. Glover; Sgt. K. E. Green; F/O. R. G. A. Harvey, D.F.M.; F/O. E. C. Hentsch; F/O. J. Howarth, D.F.M.; Flt. Sgt. A. V. Jackson; Sgt. J. R. Jackson; F/O. M. Jenkins; Flt. Sgt. N. Jennings; Sgt. H. John; Sgt. A. W. Johnson; F/O. R. H. Johnson; F/O. B. C. Jones; Sqn. Ldr. S. D. Jones, D.F.C.; Sgt. A. J. Keveren; Sgt. W. C. W. King; Flt. Sgt. D. B. Laidlaw; Sgt. E. Lee; Sgt. D. S. Lockett; Sgt. G. F. Lowe; Sgt. A. McCormick; Flt. Sgt. R. L. Mason; Sgt. L. D. Maynard; Sgt. C. A. Mills; Flt. Sgt. K. G. Mitchell; P/O. W. P. Moroney; Act. Sqn. Ldr. E. H. Moss; Act. Flt. Lt. C. W. Nichol; Sgt. L. H. Nightingale; Sgt. W. Orr; Sgt. H. W. Parsons; Sgt. J. C. Patten; Sgt. E. Peacock; P/O. K. Pearce; P/O. H. W. Platten; P/O. G. F. Polley; F/O. G. C. Reed; F/O. I. J. F. Rich; Sgt. G. G. Rhivard; Sgt. P. D. Ruiz-de-Velasco; Sgt. D. Smith; Sgt. T. A. Smith; Sgt. L. S. Snddick; Sgt. D. R. Tarling; F/O. D. G. Turner; Flt. Sgt. S. J. Upton; Sgt. G. Walker; Sgt. R. Walmsley; Sgt. R. T. Wevill; Sgt. R. Whalley; Sgt. G. F. White; Sgt. G. Williams.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sqn. Ldr. F. Larman.

KILLED ON ACTIVE SERVICE.—A/C.2 S. J. Brandon; Flt. Lt. D. Constant; Wing Cdr. W. C. S. A. G. Cooper; Sgt. C. C. Crawley; Sgt. E. Crosland; Sgt. J. W. Day; Sgt. G. H. Evans; L.A.C. J. H. Jewett; Flt. Lt. W. J. N. Lee; Cpl. W. Linley; L.A.C. O. J. McGowan; Sgt. J. Marsden; Flt. Lt. R. H. J. Mountford; Sgt. H. Newton; F/O. C. E. Robertson; Sgt. F. Sefton; Wing Cdr. H. A. Simmons; Sgt. F. N. Simpson; Sgt. E. Stephens; F/O. R. E. J. Thornton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. W. F. Barker; Sgt. J. Ralph; Sgt. W. J. Thorne.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.1 H. Goodall; W/O. R. F. Ladkin; Act. Flt. Lt. R. F. Murray; A/C.2 G. R. Prosser.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. R. J. Baird; F/O. J. C. Beck, D.F.M.; F/O. A. B. Brentnall; L.A/C. C. W. H. Brook; P/O. P. D. A. G. D'Arcy; Flt. Sgt. H. A. Marshall; P/O. K. L. Porter.

DIED ON ACTIVE SERVICE.—A/C.2 J. C. Crisp; F/O. A. M. Dickinson; Sgt. F. J. Harrison; L.A/C. G. A. Lee; P/O. B. M. Luckett; L.A/C. E. R. Maggs; Cpl. T. Quinn; Sgt. C. L. Wiseman.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/C/W.1 E. Nichols; Cpl. D. J. Whent.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. M. Fischer; P/O. L. McKay; Sgt. R. G. Spencer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. A. M. Davis; Flt. Sgt. R. O. Harris; P/O. K. H. Holman; Sgt. T. P. Laird; Flt. Sgt. N. A. Rubens; Sqn. Ldr. J. R. Savage; P/O. W. G. Shillinglaw; Flt. Sgt. F. C. Taylor; Flt. Sgt. R. E. Thorpe; F/O. G. W. Walters.

MISSING.—F/O. J. P. Bird; P/O. A. G. J. Chadwick-Bates; Flt. Sgt. A. F. Drummond; Flt. Sgt. D. G. Duncombe; Flt. Sgt. K. Finch; W/O. J. I. Goodwin; Flt. Sgt. A. C. Johns; P/O. A. J. Jubb; P/O. R. J. McCleery; Flt. Lt. A. F. McKinnon D.F.C.; P/O. J. H. Thomson; Sqn. Ldr. E. A. G. Utz, D.F.C.; Flt. Sgt. J. D. West.

KILLED ON ACTIVE SERVICE.—Sgt. T. O. James; F/O. C. Levings.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. H. J. Richardson.

Royal Canadian Air Force

KILLED IN ACTION.—F/O. E. G. Armour; Sgt. R. L. Ballentine; F/O. D. C. Evans; P/O. D. E. Jackson; Sgt. R. R. McGregor; F/O. H. C. C. Read; Sgt. J. S. Sleigher; F/O. D. L. Smith; P/O. D. A. Thicke.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. L. Bandle; Flt. Lt. D. E. Cawker; Sgt. A. F. De Dauw; F/O. W. T. Fulton; Flt. Sgt. H. H. Gray; Sgt. L. R. Ingell; F/O. F. J. King; Sgt. J. W. MacLean; F/O. C. Rudyk; P/O. L. K. Sears; Sgt. G. F. A. Thompson; W/O. P. Warywoda; Flt. Sgt. T. E. Wilkinson; P/O. H. G. Wright.

MISSING.—F/O. D. H. Bailey; Flt. Sgt. R. L. Barr; P/O. A. M. J. Bell; Flt. Sgt. J. Bell; Flt. Sgt. J. N. E. Bennett; Sgt. C. Bertola; Flt. Lt. H. H. Bow; F/O. J. D. Brown; F/O. R. C. Collins; F/O. J. F. Creba; F/O. J. L. Dobbyn; F/O. K. V. Duffield; F/O. G. C. Dunkley; Sgt. L. J. Dunn; Sgt. H. A. Frizzell; W/O. J. A. P. H. Gaboury; F/O. K. W. Gorkon; F/O. C. G. Hetherington; W/O. C. W. Hay; F/O. J. A. Ilnicki; W/O. E. S. Jacquest; W/O. G. K. Jarvis; Sgt. D. A. Laird; W/O. D. A. P. Ledrew; Sgt. O. A. Linton; Flt. Sgt. W. J. McMeekan; W/O. H. J. McLean; W/O. L. Marshall; F/O. E. W. Mellanier; P/O. A. D. Morton; Sgt. R. H. Murdoch; W/O. S. Mylnski; W/O. D. J. O'Brien.

FOOTBALL IN ALGIERS: Before a recent Army versus R.A.F. football match in Algiers, the players were presented to Air Vice-Marshall J. H. D'Albiac, who is seen shaking hands with an R.A.F. player. The Army won by five goals to one.

SERVICE AVIATION

W/O. J. C. Owens; Flt. Lt. R. R. Perry; Sgt. D. W. Pulham; F/O. R. J. Roach; F/O. H. B. Steeves; Flt. Sgt. R. J. Thompson; F/O. C. E. Tindall; W/O. F. J. Vid; Flt. Lt. C. A. Walker.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—W/O. C. L. Logan.

KILLED ON ACTIVE SERVICE.—F/O. W. D. Armour; F/O. J. G. Falloon; P/O. D. H. D. Grover; Flt. Sgt. J. G. B. Hall; Flt. Lt. R. A. S. Lasser; F/O. J. N. G. Leclerc; Flt. Lt. G. B. Leddy, D.F.C.; F/O. A. J. Morris, A.F.M.; Flt. Lt. N. E. Pollock; Flt. Sgt. R. S. Porter; F/O. W. M. Rawbone; Sgt. D. M. Smith.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. E. A. W. Ross.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. T. W. Dimma, D.F.M.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. W. J. Cameron; F/O. R. D. Guess.

Royal New Zealand Air Force

MISSING.—F/O. J. G. Cox; Flt. Sgt. J. A. Mullally.

South African Air Force

KILLED IN ACTION.—Lt. J. G. Lamb.

Casualty Communiqué No. 400.

Of the names in this list, 91 are second entries giving later information of casualties published in earlier lists

Royal Air Force

KILLED IN ACTION.—Sgt. D. Addy; P/O. C. J. Barton, D.C.; Sgt. D. R. Billson; Sgt. R. A. J. Collier; Sgt. H. W. O. Pigram; Flt. Sgt. E. B. Thomas; F/O. D. W. McE. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. B. H. Scudder.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. D. Allattson; Sgt. E. C. A. Blake; F/O. G. W. Bond; P/O. W. G. Divall; P/O. F. B. Edwards; F/O. J. L. Foster; Sgt. J. F. Harkness; Sgt. A. J. Hodgkins; Flt. Sgt. R. C. McArthur; P/O. G. S. Miles; Sgt. B. Ridsdale; Flt. Sgt. J. S. Simpson; Sgt. A. A. Williams.

WOUNDED OR INJURED IN ACTION.—Sgt. A. H. Brown; Sgt. M. E. Trousdale.

MISSING, BELIEVED KILLED IN ACTION.—Act. W/O. J. C. Baxter, D.F.M.; Sgt. P. H. Brown; P/O. W. H. Burnett; Sgt. D. A. Chaston; Sgt. D. G. Cutler; Flt. Sgt. A. G. Drake; F/O. H. C. Frost; W/O. V. Gardner, D.F.M.; Sgt. G. W. Jeffery; Flt. Sgt. K. J. Shropshall; P/O. F. W. Shuttle; Sgt. F. Storer.

MISSING.—F/O. W. I. Adamson; P/O. A. S. Arneil; Flt. Sgt. T. Ashton; Sgt. R. J. Asplen; Sgt. E. Bake; Sgt. J. Baldwin; Flt. Sgt. E. Bates; Sgt. J. E. Bates; Sgt. R. W. Beech; Act. Flt. Lt. D. R. Beale; Sgt. P. R. Beilby; Sgt. D. B. Bloomfield; Sgt. N. H. Bowyer; Sgt. J. Breaker; Sgt. R. Byth; Sqn. Ldr. K. A. Clack; Sgt. G. R. Collins; Sgt. A. Cooke; Sgt. N. R. Cottrell; Sgt. J. Coup; Sgt. W. Crory; Sgt. J. B. D'Arcy; Sgt. P. E. Davies; Sgt. C. F. C. Davis; Flt. Sgt. R. Dawson; F/O. H. A. Devon; Act. Flt. Lt. A. Dickinson; Sgt. L. H. J. Dixon; Sgt. J. D. Dyson; Sgt. R. A. Eastman; P/O. D. H. Edwards; Sgt. P. A. Esop; Act. Flt. Lt. S. Evans; Flt. Sgt. D. D. Finlay; Flt. Lt. E. Francis, D.F.C.; Sgt. K. G. Francis; Sgt. S. P. Frith; P/O. C. A. Frost; Sgt. F. T. Fuller; Sgt. J. A. Goodall; Sgt. J. Grant; F/O. G. C. Greenacre; Act. Flt. Sgt. R. E. Greenfield; Flt. Sgt. F. Gregory; Sgt. W. Haden; Sgt. J. Hamlin; Sgt. R. T. Harper; F/O. J. W. Henry; Sgt. H. L. Hepworth; P/O. D. S. Heys; Flt. Sgt. E. Hill; Act. Flt. Sgt. T. J. Hirst; Sgt. A. Horsfield; Act. Flt. Lt. L. V. Hyde; P/O. G. W. Ingham; Sgt. A. J. N. Jamieson; Sgt. W. Jenkins; Sgt. A. J. Johnson; Sgt. A. C. Kendrick; Act. Flt. Lt. F. A. Kent; P/O. E. McC. Kippen; Sgt. A. Latham; P/O. F. G. Leahy; F/O. P. E. Legard; Sgt. T. B. Liddle; Sgt. H. Longton; Sgt. G. J. Low; Flt. Sgt. J. A. McClean; Sgt. T. McFadden; F/O. D. B. McIntosh; F/O. N. Marrian; Sgt. E. Martin; F/O. W. B. Mathias; Sgt. D. Maughan; Sgt. J. A. May; Flt. Lt. B. B. Mill; Sgt. A. R. Morgan; Sgt. P. Newman; Act. Sqn. Ldr. T. M. Nicholls; Sgt. A. B. Norris; P/O. D. C. Nowell; Sgt. R. H. F. Ogborne; Sgt. H. F. Page; Act. Flt. Lt. E. H. Palmer; P/O. C. W. Panton; Sgt. F. B. Patey; Sgt. L. W. A. Peall; Sgt F. Phillips; P/O. E. Pickin; Sgt. A. E Pinks; P/O. R. H. Pitman; Sgt. E. R. W. Pond; Sgt. W. Prest; Sgt. G. C. Prince; Flt. Lt. G. A. Procter; P/O. M. E. Putt; Sgt. L. E. Read; Sgt. G. T. W. Reynolds; Sgt. J. F. Richardson; Flt. Sgt. V. A. Sanderson; P/O. F. R. Smith; Sgt. F. Stanton; Sgt. J. Stevens; Sgt. M. M. Stillard; P/O. J. Sutton; P/O. R. Taylor; Sgt. J. S. Thompson; Flt. Sgt. R. F. Thompson; Sgt. R. Thomson; F/O. A. Thorpe; Flt. Sgt. G. W. Triodl; Sgt. B. B. Vivour; Flt. Sgt. S. W. Wait; Flt. Lt. D. E. Walker; Flt. Sgt. P. F. Walker; Sgt. N. L. Wallis; Sgt. A. L. Wangler; F/O. R. J. Weller, D.F.M.; Act. Sqn. Ldr. C. H. Wilson, D.F.C.; F/O. F. W. Woods; Sgt. H. Wride; Sgt. H. A. Wright; F/O. J. C. Yorke.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. R. Allot; F/O. N. Brockhouse.

KILLED ON ACTIVE SERVICE. — F/O. T. W. Brumwell; Sgt. E. A. Dempsey; Sgt. D. Eastell; Sgt. A. Foote; A/C.2 B. Killner; F/O. J. A. Robertson; Sgt. D. A. Smith; Sgt. J. G. Smith; L.A/C. A. W. Stickler; F/O. R. Teed; A/C.2 T. D. Willan.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. W. R. Chinnock; Sgt. S. R. Gallop; Flt. Sgt. R. McKay; L.A/C. J. Mitchell; A/C.2 A. S. Murch.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE. — Act. Flt. Lt. P. E. Cadman.

DIED ON ACTIVE SERVICE.—L.A/C. F. W. J. Adams; A/C.1 S. W. P. Brown; L.A/C. J. Evans; A/C. 1 J. J. Greenwood; L.A/C. L. D. Hewins; Flt. Lt. W. E. Hughes; Sgt. D. MacGillivray; Cpl. A. E. Marshall; Cpl. F. A. Roberts; A/C.1 E. Thompson; Sgt. E. A. Woodrow.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. F. A. Rowlands.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. G. Evans; Sgt. R. V. Hombsch.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. E. F. Baker; P/O. C. G. Benjamin; Flt. Sgt. T. E. Bent; W/O. R. M. Burcher; Flt. Sgt. J. R. Chapman; Sgt. E. A. Daley; Flt. Sgt. D. E. E. Dean; Flt. Sgt. D. B. Giles; Flt. Sgt. A. W. H. Gliddon; Flt. Sgt. J. E. Goddard; F/O. L. Y. Hazekline; Flt. Sgt. D. C. Houghton; Flt. Sgt. K. T. R. Lucas; Flt. Sgt. R. W. Park; P/O. K. J. Simpson.

MISSING, BELIEVED KILLED IN ACTION.—F/O. M. M. Corcoran; P/O. C. A. Rose.

MISSING.—Flt. Sgt. W. J. Adam; P/O. J. W. Carter; Flt. Sgt. N. G. Huggett; P/O. D. J. Irving; W/O. S. G. R. King; P/O. R. E. Llewelyn; Flt. Sgt. J. M. Mooney; W/O. J. A. Murphy; Flt. Sgt. J. B. Newman; Flt. Sgt. J. A. Noske; Flt. Sgt. K. W. Ward; W/O. G. R. N. Wood.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. B Huxley; F/O. D. F. Parsons.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. N. R. Linton.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. L. C. Graham; Flt. Sgt. I. R. McNay; W/O. A. N. Rice.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. L. A. Doherty; F/O. R. W. Fulton; F/O. J. R. Harrison; Flt. Lt. D. E. Hicks; W/O. S. W. Lucyk; Sgt. H. Russell; Sgt. R. A. Wells.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. G. W. Askew; W/O. D. Betts; Flt. Lt. R. T. Botkin; W/O. G. W. Bower; P/O L. G. E. Burnett; Flt. Sgt. R. S. L. Day; P/O. F. A. Doherty; P/O. D. C. D. Duboulay; Flt. Sgt. G. S. Feakes; F/O. A. J. Gibson; Flt. Sgt. T. K. Green; Flt. Sgt. B. B. Harrison; Flt. Sgt. C. T. Hele; Flt. Sgt. L. M. Hill; F/O. W. E. Hinchcliffe; W/O. J. A. N. Hucker; Flt. Sgt. A. G. Knuuttila; Sgt. G. Labuik; Sgt. M. Lavoie; F/O. M. T. Ludlow; Flt. Sgt. L. B. McBride; F/O. D. H. McKay; Flt. Sgt. A. S. MacLaren; Flt. Sgt. T. E. Martin; F/O. G. Miller; P/O. E. G. More; Flt. Sgt. P. A. Musso; Sgt. F. J. Payne; Flt. Sgt. O. H. Phœnix; Flt. Sgt. A. L. Porter; Flt. Sgt. W. E. Ross; Sqn. Ldr. M. S. F. Schneider; Flt. Sgt. D. R. See; Act. Flt. Lt. W. L. Shaw; Sgt. F. L. Shellnutt; Sgt. A. T. Sodero; P/O. R. E. Taylor, D.F.M.; Act. W/O. D. H. Thompson; F/O. K. M. Walley; Flt. Sgt. J. H. Walton; P/O. J. Williams.

WOUNDED OR INJURED IN ACTION.—P/O. D. McCrae.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. H. M. Coffey; F/O. J. D. Laidlaw; Sgt. R. F. Thibedeau; F/O. R. K. Thomson.

MISSING.—W/O. F. Anderson; Flt. Sgt. L. G. Anderson; P/O. D. McL. Awry; P/O. G. W. Brockway; W/O. D. W. Burke; F/O. R. H. Carleton; Sgt. H. A. Clark; Sgt. R. L. Clarkson; Flt. Lt. W. C. Cracknell; F/O. J. Craig; W/O. S. H. Cullen; P/O. A. H. Death; P/O. A. G. Devey; F/O. W. A. Dixon; Sgt. N. T. Edmondson; Flt. Sgt. L. A. Ferguson; F/O. J. S. Ferrier; Flt. Sgt. R. C. Haycock; Flt. Sgt. E. F. Jarvis; W/O. E. C. Johnston; W/O. D. J. Laberge; F/O. J. I. Labow; F/O. T. W. Lavery; F/O. R. F. Litchfield; Flt. Sgt. J. D. McCreary; P/O. A. D. Maw; P/O. J. P. Merritt; P/O. L. V. Milward; Flt. Sgt. R. E. Mogalki; Flt. Sgt. C. R. Narum; F/O. C. E. O'Brien; Flt. Sgt. H. F. Orr; Flt. Lt. R. H. Osborn; P/O. A. A. Patton; Sgt. R. W. Rathwell; F/O. E. K. Reid; F/O. L. E. Robinson; W/O. W. F. Rost; Sgt. S. Saprunoff; Flt. Sgt. W. E. Sargent; Sgt. D. L. Schlin; P/O. J. H. Thornton; Sgt. G. R. Thorpe; F/O. I. J. Toppings; F/O. R. D. Van Fleet.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. R. A. McDonald.

KILLED ON ACTIVE SERVICE.—Sgt. A. S. Gillies.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. V. Hindin; Flt. Sgt. D. A. Williston.

An air ambulance Anson with a perspex nose being autographed by Lord Sherwood. With him are Air Chief Marshal Sir Frederick Bowhill and Student Nurse W. A. Varnell.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Lt. J. G. Knight.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. N. Darney; Flt. Sgt. I. E. Kippenberger; Flt. Sgt. L. B. McCallum; F/O. J. Pattison; Flt. Sgt. I. G. Ramsay; Flt. Sgt. R. J. Stone; Flt. Sgt. T. J. Vercoe.

MISSING.—P/O. K. D. Matheson; W/O. M. C. Moosman; P/O. W. M. Mulholland; W/O. J. M. Oliver; Act. Flt. Lt. M. U. Robinson.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Lt. W. M. Trenbath.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. U. C. Johnston.

DIED ON ACTIVE SERVICE.—Air Mech. R. D. Turner.

Shellnutt;
D.F.M.;
d. Walley;
Williams.
—P/O. D.

TION.—Sgt.
Sgt. R. F.

Sgt. L. G.
/O. G. W.
t. H. Carle
arkson; Flt.
W/O. S. H.
G. Devoy;
ondson; Flt.
er; Flt. Sgt.
W/O. E. C.
J. I. Labow;
chfield; Flt.
Maw; P/O.
d; Flt. Sgt.
; F/O. C. F.
Lt. R. H.
R. W. Ratli
E. Robinson;
ff; Flt. Sgt.
P/O. J. H
J. Toppings;

ACTIVE SER-

A S. Gillies.
BELIEVED
PRESUMED
V. Hindlin;

ir Force

Knight.
Now PRE-
Sgt. J. N.
er; Flt. Sgt.
Flt. Sgt. I. G.
t. Sgt. T. J.

W/O M. C.
W/O. J. M.
on

Force

Now RE
M. Trembath
Sgt. U. C.

Mech R. D